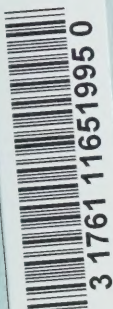


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# ENVIRONMENTAL ASSESSMENT BOARD

VOLUME: 74

DATE: Tuesday, February 21st, 1989

BEFORE: M.I. JEFFERY, Q.C., Chairman

E. MARTEL, Member

A. KOVEN, Member

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HEARING ON THE PROPOSAL BY THE MINISTRY OF NATURAL  
RESOURCES FOR A CLASS ENVIRONMENTAL ASSESSMENT FOR  
TIMBER MANAGEMENT ON CROWN LANDS IN ONTARIO

IN THE MATTER of the Environmental  
Assessment Act, R.S.O. 1980, c.140;

- and -

IN THE MATTER of the Class Environmental  
Assessment for Timber Management on Crown  
Lands in Ontario;

- and -

IN THE MATTER of an Order-in-Council  
(O.C. 2449/87) authorizing the  
Environmental Assessment Board to  
administer a funding program, in  
connection with the environmental  
assessment hearing with respect to the  
Timber Management Class  
Environmental Assessment, and to  
distribute funds to qualified  
participants.

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Hearing held at the Ramada Prince Arthur  
Hotel, 17 North Cumberland St., Thunder  
Bay, Ontario, on Tuesday, February 21st,  
1989, commencing at 9:00 a.m.

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VOLUME 74

BEFORE:

MR. MICHAEL I. JEFFERY, Q.C.	Chairman
MR. ELIE MARTEL	Member
MRS. ANNE KOVEN	Member





A P P E A R A N C E S

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MS. Y. HERSCHER )	
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MS. J. SEABORN )	
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MR. R. COSMAN )	ASSOCIATION and ONTARIO
MS. E. CRONK )	LUMBER MANUFACTURERS'
MR. P.R. CASSIDY )	ASSOCIATION
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MR. D. HUNTER	NISHNAWBE-ASKI NATION
	and WINDIGO TRIBAL COUNCIL
MR. J.F. CASTRILLI)	
MS. M. SWENARCHUK )	FORESTS FOR TOMORROW
MR. R. LINDGREN )	
MR. P. SANFORD )	KIMBERLY-CLARK OF CANADA
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MR. R. EDWARDS )	NORTHERN ONTARIO TOURIST
MR. B. McKERCHER)	OUTFITTERS ASSOCIATION
MR. L. GREENSPOON)	NORTHWATCH
MS. B. LLOYD )	





APPEARANCES: (Cont'd)

MR. J.W. ERICKSON, Q.C.) MR. B. BABCOCK )	RED LAKE-EAR FALLS JOINT MUNICIPAL COMMITTEE
MR. D. SCOTT ) MR. J.S. TAYLOR)	NORTHWESTERN ONTARIO ASSOCIATED CHAMBERS OF COMMERCE
MR. J.W. HARBELL) MR. S.M. MAKUCH )	GREAT LAKES FOREST
MR. J. EBBS	ONTARIO PROFESSIONAL FORESTERS ASSOCIATION
MR. D. KING	VENTURE TOURISM ASSOCIATION OF ONTARIO
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MR. G.J. KINLIN	DEPARTMENT OF JUSTICE
MR. S.J. STEPINAC	MINISTRY OF NORTHERN DEVELOPMENT & MINES
MR. M. COATES	ONTARIO FORESTRY ASSOCIATION
MR. P. ODORIZZI	BEARDMORE-LAKE NIPIGON WATCHDOG SOCIETY
MR. R.L. AXFORD	CANADIAN ASSOCIATION OF SINGLE INDUSTRY TOWNS
MR. M.O. EDWARDS	FORT FRANCES CHAMBER OF COMMERCE
MR. P.D. McCUTCHEON	GEORGE NIXON





(iii)

APPEARANCES: (Cont'd)

MR. C. BRUNETTA

NORTHWESTERN ONTARIO  
TOURISM ASSOCIATION





I N D E X   O F   P R O C E E D I N G S

<u>Witness:</u>	<u>Page No.</u>
<u>KENNETH ARMSON</u> , Resumed	12474
Continued Direct by Mr. Freidin	12474
Cross-Examination by Mr. Cosman	12532
Cross-Examination by Ms. Swenarchuk	12554





I N D E X   O F   E X H I B I T S

<u>Exhibit No.</u>	<u>Description</u>	<u>Page No.</u>
419A	Package of documents consisting of Undertakings Panel IX and responses thereto.	12499
419B	Paper of Kenneth Armson dated December 2, 1988 entitled: Clearcuts.	12499
420	Bundle of documents consisting of MOE Interrogatory No. 1 & 2 (Panel No. 9); MOE Interrogatory No. 8; Forests for Tomorrow Interrogatory No. 6 (Panel No. 10).	12532
421	Fall publication of Canadian Forestry Services Survey Bulletin.	12536
422	Paper entitled: Influence of Wood Harvesting on the Nutrient Status of Two Spruce Stands, by G.F. Weetman and B. Webber.	12590
423	Document entitled: Nutrient Cycling Dynamics in Differing Spruce and Mixedwood Ecosystems in Ontario and the Effects of Nutrient Removals through Harvesting by Allan G. Gordon, dated 1983.	12595



1 ----Upon commencing at 9:05 a.m.

2 THE CHAIRMAN: Good morning. Please be  
3 seated. Mr. Freidin are you ready to go?

4 Just before we go, is Mr. Edwards present  
5 at all? We received a letter addressed to the Board  
6 from Mr. Edwards indicating his client's objections and  
7 concern with the Board's proposed site visit in that  
8 his client had not been given, in his view, enough time  
9 for meaningful input; and, secondly, his client was not  
10 sure whether there would be any benefit from the Board  
11 viewing anything in the forest during the winter  
12 season.

13 We have instructed Mr. Mander to respond  
14 to Mr. Edwards to firstly indicate that it is a one-day  
15 site visit, the Board does feel that it will be of  
16 benefit to the Board, particularly coming just ahead of  
17 Panel 10's evidence, which is the panel dealing with  
18 harvesting.

19 And secondly, we want to put on the  
20 record that this does not mean, in any way, that the  
21 Board will necessarily not visit the Timmins area at  
22 some point in the future on another site visit which  
23 will encompass maybe that area and other areas in  
24 different seasons. And future site visits will likely  
25 be organized in a fashion as the previous ones and;



1       that is, with sufficient time for all of the parties to  
2       put in the request for what the Board should see.

3               So the Board is rejecting his  
4       representations that we should cancel this site visit  
5       and feels that it will be of benefit and it will not  
6       prejudice his clients in any way.

7               He also raised the concern by the way in  
8       the letter to the effect that it was his understanding  
9       that lawyers were not necessarily to be present on any  
10      of these site visits. That is not the case in  
11      connection with the site visits.

12              Lawyers representing their clients or  
13      various parties or representatives of parties are  
14      welcome to attend on the site visits with some of the  
15      rules set down by the Board earlier; that is, there  
16      will be no conversing with the Board members on the  
17      details of what is being seen. In some cases, such as  
18      a mill tour, there will obviously be somebody leading  
19      the Board through the mill indicating what the Board is  
20      seeing, but that will be kept to factual information  
21      only.

22              I thought that we should put that on the  
23      record, particularly in view of the fact that Mr.  
24      Edwards is not here.

25              Thank you.

1 Mr. Freidin?

2 KENNETH ARMSON, Resumed

3 MR. FREIDIN: I would like to go back,  
4 Mr. Chairman, and just ask a few questions which arose  
5 from last day's evidence. The first number of  
6 questions relate to the Timmer paper which is found at  
7 page 451 of the Panel 10 witness statement.

8 CONTINUED DIRECT EXAMINATION BY MR. FREIDIN:

9 Q. And during your evidence, Mr. Armson,  
10 when you were dealing with that Timmer paper and in a  
11 way comparing it to some of the other papers which are  
12 cited in the material, you indicated that the authors  
13 of the Timmer paper assume a steady state, and you said  
14 that the others - referring to the other authors -  
15 indicated that you can't assume a steady state.

16 Could you explain what you mean by a  
17 steady state?

18 A. Well, a steady state - and actually  
19 this is stated very clearly in the Timmer article - and  
20 if I might draw the Board's attention to page 463,  
21 probably the simplest way is to cite the definition  
22 there.

23 And it is in the second paragraph, a  
24 short paragraph on page 463 and, if I might just read  
25 that entire paragraph, I think this will give -- it

1       says:

2                       "Nutrient losses relative to site  
3                       nutrient capital are given in Table 7 for  
4                       tree-length and for full-tree logging."

5       It is referring to the table:

6                       "Under a steady state model of eco-system  
7                       dynamics..."

8       And there are I think two references given there:

9                       "...inputs are balanced by outputs, thus  
10                      values exceeding one hundred per cent  
11                      indicate that insufficient nutrients  
12                      remain on the site to support second crop  
13                      of equal size."

14       So by the steady state, in other words, they take the  
15       amount of nutrients that are taken off, relate that to  
16       the measured amount of nutrients in the pools that are  
17       left, the forest floor and the soil, and then in fact  
18       subtract the one from the other and come up with a  
19       deficit or a surplus.

20                      The problem - and as I explained I believe  
21       to the Board and as many other scientists have noted -  
22       is that that does not take into account, first of all,  
23       two things:

24                      One is that measurable nutrients in one  
25       of the pools in particular, that is the soil, the



1 mineral soil is done by chemical methods which, in a  
2 sense, are arbitrary. Secondly, much more important is  
3 that the weathering or the movement of nutrients  
4 particularly from the soil minerals by weathering into  
5 the soil solution - and that will, therefore,  
6 constitute flux - is regarded by, I believe, most  
7 scientists as a key area in which we really don't know  
8 what the dimension of that flux is in many instances  
9 and there are a number of articles - and I can cite one  
10 in particular if the Board was interested - which draws  
11 that to a very clear -- there is a very clear  
12 exposition of that problem.

13 MS. SWENARCHUK: Can we have that,  
14 please?

15 MR. FREIDIN: Sorry?

16 MS. SWENARCHUK: Can we have that  
17 citation?

18 MR. ARMSON: Yes. This is in the  
19 Canadian Journal of Soil Science, Volume 66, November,  
20 1986, Fourth Report and the article is titled:  
21 Nutrient Cycling and Availability in Forest Soils. And  
22 it was an invited review article; that is the Canadian  
23 Journal of Science invited these scientists to prepare  
24 it.

25 The authors are, in order, a Dr. M. K.

1 M-a-h-e-n-d-r-a-p-p-a, and he is with the Forestry  
2 Canada, he is a research soil scientist with Forestry  
3 Canada in the Maritimes; Dr. N. W. Foster who is a  
4 research scientist with Forestry Canada and the Great  
5 Lakes Forestry Centre in Sault Ste. Marie, Ontario;  
6 Professor Gordon F. Weetman is a professor of  
7 silviculture and also a soil scientist at the  
8 University of British Columbia and Professor H. H.  
9 Krause, that is K-r-a-u-s-e, who is professor of forest  
10 soils at the University of New Brunswick.

11 And this review article is specifically  
12 dealing with the whole matter of, as I say, nutrient  
13 cycling availability in forest soils and with very  
14 specific reference to the Canadian conditions.

15 MR. FREIDIN: And that particular  
16 article is cited at page 273 of Exhibit 416A.

17 Q. While you have got that Timmer  
18 article there, Mr. Armson, could you turn to page 465.  
19 On that page we find the recommendations of that paper.

20 You commented on the first two bullet  
21 points and last bullet point the other day in your  
22 evidence. I am just wondering whether you could  
23 comment on the four bullet points which we find  
24 inbetween?

25 A. Well, the third bullet point reads:

1 "marginal sites which are sensitive to  
2 full-tree or complete-tree logging be  
3 harvested in the winter with snow  
4 present."

5 I believe I have made it clear, I am not sure what a  
6 marginal site is unless it is defined by -- I inferred  
7 from the article that it is talking about shallow soil  
8 sites, but that's not clear. I presume complete-tree  
9 means whole tree, but again I am not sure about of  
10 that, I think that's probably -- and I am not sure why  
11 the snow is such a factor.

12 I guess the problem with the  
13 recommendation is that it raises a number of questions  
14 rather than answers questions. The fourth bullet:

15 "hardwood sites be harvested by  
16 full-tree methods in the dormant  
17 (leafless) season."

18 This seems to bear no relation to anything very  
19 specific. Presumably the intent is that you wouldn't  
20 take the foliage with the tops in the leafless season,  
21 but what kind of site conditions are not really  
22 specified. The next bullet says:

23 "mechanical flailing or delimbing devices  
24 be operated on sites which are sensitive  
25 to intensive harvesting."



1 Again, it is a very general sort of a thing and I am  
2 not -- it leaves hanging what is sensitive and from  
3 intensive I presume means full-tree harvesting.

4 And then the final bullet that I did not  
5 speak to:

6 "rapid regeneration or active  
7 revegetation be ensured after whole-tree  
8 chipping to accelerate nutrient capture  
9 and site recovery processes."

10 I think I have already explained to the Board that's a  
11 normal sequence, certainly that as a recommendation I  
12 have no problem with that one.

13 Q. And what is whole-tree chipping?

14 A. Whole tree would be -- well,  
15 whole-tree...

16 Q. I am sorry.

17 A. I think they mean full-tree chipping,  
18 I don't think they mean whole-tree. A whole-tree in  
19 our discussion would mean the bole, the crown and the  
20 root systems; whereas full-tree refers to everything  
21 about the stump.

22 I might add, I am not aware of any  
23 whole-tree harvesting in Ontario.

24 Q. Now, one of the photographs that you  
25 showed the other day, Exhibit 418K, was a white pine

1 stand that had been harvested on thin soils over  
2 bedrock, that was I think the photograph which showed  
3 the root system sort of intertwined within the bedrock  
4 itself?

5 A. Yes.

6 Q. And in relation to that photograph,  
7 the Chairman asked you a question - sort of a  
8 rhetorical question - and said: Well, in that  
9 situation, Mr. Armson, you wouldn't full-tree harvest.  
10 And I have your answer as being yes, like you agreed  
11 with the Chairman.

12 Could you indicate why you agreed with  
13 that statement?

14 A. Well, it was from a knowledge of the  
15 stand rather than just the photograph. Obviously the  
16 photograph was to display the root system in the  
17 bedrock, but the area was such - in terms of the  
18 relative amount of exposure of bedrock and its  
19 particular location, that in my judgment I would not  
20 use a full-tree system on it and that would mean that  
21 we would be in fact having crowns, the slash left on  
22 these areas of bedrock. As I said the felling was done  
23 so -- in order to cover it.

24 Q. I don't think I've caught -- maybe  
25 you didn't indicate. Could you tell: What was the

1 information or the knowledge that you had in addition  
2 to what you observed in the picture which makes you say  
3 that full-tree harvesting not be done?

4 A. The extent of the area, the relative  
5 proportion of exposed bedrock and mosses and so on,  
6 that that would be the reason. That didn't show in the  
7 photograph.

8 Q. You made a comment that on stands  
9 such as that where you have got fissures in bedrock  
10 that the new stand that comes back after harvesting  
11 live on their ancestors. And could you just explain  
12 what you meant by that?

13 A. Well, the fissures and cracks have  
14 been quite obviously exploited by root systems of  
15 succeeding generations of trees, most probably white  
16 pine and, as I indicated, the material is quite well  
17 decomposed and, in effect, the root systems of the  
18 existing stands were then not only gaining nourishment  
19 but also moisture from those same -- that material in  
20 there. That's what I meant by living on their  
21 ancestors.

22 Q. And if you full-tree harvest a site,  
23 can you advise per cent - like the one that you  
24 displayed in 418K - can you indicate what percentage of  
25 the contribution of nutrients for the new stand would



1       come from the slash that would be left if in fact you  
2       didn't full-tree harvest?

3                       A. Well, I can't give a quantification.  
4       What I can indicate is that from my experience and  
5       what -- that the amount of nutrients in the slash would  
6       be a relatively small proportion of the total available  
7       in those fissures from the decayed material and the  
8       basis would be this:

9                       That the crowns, first of all, over 80 or  
10      100 years, the amount of nutrient in the existing  
11      foliage at the time that it would be harvested would be  
12      a relatively small amount of the total that has been  
13      cycle within the stand or within the trees during that  
14      80, 100 years.

15                      One then takes into account that there  
16      have been succeeding generations of forest there, as I  
17      say white pine, not exactly since the retreat of the  
18      ice, but certainly there has been forest vegetation  
19      there for several thousand years, then what you are  
20      dealing with in any one instant in time is a relatively  
21      small amount of that total; some of which, of course,  
22      will be lost in the system over that period too.

23                      Q. And One last question before we  
24      continue on with the last part of Panel No. 9. You  
25      have indicated a number of times that in terms of this

1       nutrient cycling one area which is not -- is an area  
2       where there are problems is to determine the actual  
3       rate of flux from the residual pool of nutrients and by  
4       that meaning the rate at which the nutrients in that  
5       pool become available.

6                   A. That is a problem and, as I say,  
7       there is a secondary one which is the actual  
8       measurement of the pool itself in the soil.

9                   Q. Well, without knowing the rate of  
10      flux, how are you able to say whether the rate at which  
11      nutrients will become available from the residual pool  
12      are will or will not be great enough to maintain site  
13      productivity?

14                  A. Without knowing the actual rates, the  
15      only thing we have to go by are the observations or  
16      measurements that are made of regeneration of new  
17      stands that have followed disturbance, in some  
18      instances by full-tree harvesting, some areas where  
19      there can be some relevant comparison to another  
20      logging system and there is no -- to my knowledge, no  
21      clear evidence that the full-tree harvesting system per  
22      se has had any influence on the development of  
23      revegetation and particularly regeneration.

24                  And in terms of measuring that as a  
25      measure of its productivity, I don't know of any

1 explanations or observations that would suggest the  
2 productivity from the...

3 Q. Okay. The second last area that I  
4 wanted to deal with on Panel No. 9 was the area of  
5 assessing significance of change which I believe starts  
6 at page 53 of your witness statement.

7 And in that paper you indicate that the  
8 proper benchmark against which to measure the impact of  
9 a silvicultural treatment is the effect that would  
10 occur after natural disturbance; is that correct?

11 A. That's correct.

12 Q. Could you advise why you indicate  
13 that the significance of the timber management activity  
14 should be assessed against that benchmark?

15 A. Well, in terms of the natural -- of  
16 the forest we are dealing with, it would seem to be the  
17 most logical benchmark in that if we are dealing with a  
18 natural forest which has been -- prior to entrance by  
19 society in terms of timber management then we would, I  
20 think- be my assumption - look at the impacts of timber  
21 management as they related then to the natural forest  
22 condition.

23 The natural forest condition is not a  
24 static one and, therefore, it would make sense to me to  
25 relate it to comparable stages in development that

1 occur in that natural forest that are analogous, in a  
2 way, to the conditions that are being dealt with in  
3 that forest during timber management.

4 Q. I understand that the Figure 13 at  
5 page 56 does speak to this particular subject matter?

6 A. Yes. I have an overhead of that if  
7 the Board may -- the figures on page 56, but I do have  
8 an overhead of that if the Board would like me to use  
9 that by way of explanation.

10 Q. I understand then, through the  
11 interrogatories, there was some confusion about this  
12 particular figure; is that correct?

13 A. That is correct.

14 Q. Perhaps you could just advise what  
15 that confusion was and perhaps address that before you  
16 go through the figure?

17 A. Yes, I will as soon as I find the  
18 actual Figure 13.

19 Well, I believe some of the confusion  
20 arose, and perhaps the confusion that I particularly am  
21 aware of was that this is, first of all, schematic, it  
22 doesn't address any particular attribute or property,  
23 but I will give the Board some examples of that  
24 property.

25 If we look at the changes that occur, for



1       example, I have discussed effect of forest fire, we  
2       have discussed the effects of clearcutting in terms of  
3       changes in nutrient levels from ash in the case of the  
4       fire from decomposition. So one of the measures that  
5       might be used would be the measure of what we call pH  
6       value. In other words, as more bases are added to a  
7       soil that value goes up and becomes less acid and it  
8       becomes -- if there is less bases, it becomes more  
9       acid.

10               So that if we were to start on the  
11       left-hand side of the graph, the vertical axis is  
12       merely an arbitrary scale, if you will. It says right  
13       now at time zero in either the natural stand, if it is  
14       prior to burning, or in a stand prior to harvesting,  
15       this is where we are. And let's say we are going to  
16       monitor the level of soil acidity by measuring pH  
17       values.

18               We know from any number of studies that  
19       have been done in natural forests following fire, and  
20       we are speaking particularly of the boreal forest, that  
21       the effect of ash is an immediate one and that the  
22       soil, particularly the surface soil layers become less  
23       acid and, in fact, the pH values go up.

24               So if you look at this purple line in  
25       here on the graph that is the one that has the most

1 extreme peak, that could represent that. What the  
2 order of magnitude is will vary.

3 We know that in terms of cutting and  
4 increased decomposition the release is much slower in  
5 term of bases, therefore, we would expect the values to  
6 rise more slowly and, in fact, the blue curve on the  
7 graph, which is the third line down on the top of the  
8 graph, would possibly represent that type of change.

9 So that we can say with respect to the  
10 pattern there are two changes; one is of lower  
11 intensity one is of much greater intensity.

12 And then over time those values will  
13 change again and we know for the fire, for example,  
14 that somewhere around 10 years after a fire, depending  
15 again on the fire, that those values will tend to come  
16 back to what they were prior to the fire condition.

17 So what we are looking at here is a -- if  
18 you say: What is the impact of the timber management  
19 activity and you go to a specific measure, then it is  
20 possible, in some instances, to place the impact in a  
21 relative way. We can say that we will not expect the  
22 soil acidity values to change much. They might, in  
23 circumstances, even go lower, but they are of a much  
24 lower order of magnitude than we would expect with  
25 fire.

1                   And this can go on -- and we don't  
2           have -- in many areas we don't know the changes in all  
3           these properties. But another property that we looked  
4           at was water yield from an area where we had had  
5           harvesting or there had been fire. There is  
6           documentation of that. So we would again expect  
7           increases in water yield.

8                   The magnitude would, of course, vary with  
9           the size of the area, intensity and so on. And so what  
10          this diagram was really meant to portray was that, if  
11          you were looking for benchmarks as to an impact and if  
12          you assume that the benchmark is related to the natural  
13          conditions, then what you have is in effect an -- over  
14          time a shifting series of values, then the question  
15          then becomes: That what if you were looking to say  
16          these are acceptable, those are not acceptable, how do  
17          you arrive at that.

18                   That just again poses some considerable  
19          questions, but you have to recognize you are not  
20          dealing with a static level.

21                   THE CHAIRMAN: Mr. Armson, is what you  
22          are intimating by this particular Figure 13, that over  
23          an appreciable length of time, if it is long enough,  
24          whatever those impacts are, they will be almost totally  
25          erased?

1 MR. ARMSON: Over a long enough time,  
2 yes, sir, I would say that in our conditions.

3 THE CHAIRMAN: So even if there was a  
4 particular impact that was judged to be at a point in  
5 time devastating, if nothing were done and it was left  
6 long enough, would it come back in your opinion to in  
7 effect a natural state?

8 MR. ARMSON: Yes. Our conditions are  
9 such in the forest that whatever we do, even almost to  
10 the point of asphaltting a road that with time  
11 vegetation will come back on that; whether it is the  
12 same, whether it comes back is another matter and I am  
13 not suggesting that this is sort of something that we  
14 should consider as really negating any concerns.

15 What I am suggesting is that that -- that  
16 revegetation will occur over time. What we should be  
17 looking at, if anything, is relating to the shifts in  
18 values as they occur in the natural forest and tying  
19 them back, if you will, to what we are doing in timber  
20 management.

21 THE CHAIRMAN: Is that not sort of a  
22 unique situation with respect to a natural resource;  
23 looking at timber and vegetation as opposed to things  
24 like some of the non-renewable resources like minerals  
25 and things like that?



1 MR. ARMSON: Yes, I believe it is.  
2 Obviously with a non-renewable resource, once it is  
3 taken out it is taken out. Here we are not dealing  
4 with that. I think we should have concern about what  
5 type of revegetation will occur and, obviously, that's  
6 something that we have to take into account in terms of  
7 our timber management objectives.

8 THE CHAIRMAN: Okay.

9 MR. FREIDIN: Q. A couple of questions  
10 about eco-systems.

11 A. Yes.

12 Q. In your evidence you have described  
13 the nutrient cycle and the hydrologic cycle. Are those  
14 the only two cycles which occur within the natural  
15 environment?

16 A. No, there are many, many, many cycles  
17 in the natural environment and those cycles can relate  
18 to various parts of the forest environment.

19 Q. And do those various processes, do  
20 they act in isolation to each other, or are they  
21 inter-related?

22 A. They are inter-related.

23 Q. Why did you choose to speak about the  
24 hydrologic and nutrient cycle only?

25 A. Because in terms of forest

1 development, particularly vegetation, water supply,  
2 nutrient supply, they are the two key requirements in  
3 terms of plant growth and that really sets the stage  
4 and forms the foundation of much of the other organisms  
5 that will be in the forest.

6 Q. In the part of your paper I think  
7 dealing with eco-systems you indicate what an  
8 eco-system approach means to you or how it should be  
9 looked at by the Board.

10 A. Well, in my - in the paper, and I  
11 refer specifically to pages 16, 17 and 18, but the text  
12 on pages 16 and 18 - what I have done here is used the  
13 concept of eco-system as it was enunciated by the  
14 originator of the term, Mr. Tanslie.

15 And I believe that what has happened is  
16 that in certain quarters certain people -- they have  
17 taken the original meaning of the term which I have  
18 expressed here - and this is, as I say the basic  
19 definition - as referring to any complex of living  
20 organisms that we isolate mentally for purposes of  
21 study. And that is quite different from many peoples'  
22 interpretation of a forest eco-system as an area of  
23 land usually - it could be water - but it could be an  
24 area in which there are living organisms, vegetation in  
25 which you can draw a line around it.

1                   In other words, it becomes an area that  
2           has dimensions. In the concept of Tanslie it was an  
3           area in which the dimensions -- you set the dimensions,  
4           you abstract. For example, if you to look at the  
5           eco-system relating to -- well, spruce budworm, you are  
6           going to look at a set of factors that are climatic,  
7           that are time related, that are related yes to  
8           vegetation, but they are related specifically to such  
9           items as the flowering times and the amount of flowers  
10          in certain species of trees.

11                   So you are taking out those elements that  
12          are pertinent to our study of the organism, in this way  
13          we'd say the budworm, you are looking at the eco-system  
14          of the budworm.

15                   Now, you can't put a physical line around  
16          that, and this is what Tanslie was really referring to.  
17          And I think that it is an extremely useful not only  
18          concept, but it aids one in looking at  
19          interrelationships and in the attempts to quantify  
20          them.

21                   If one uses the definition of, as I say,  
22          many people value; that is, trying to put a specific  
23          boundary on a piece of land, if you will, and call that  
24          an eco-system, it really denies the concept which is  
25          the dynamics of the relationships.

1                   MR. FREIDIN: Mr. Chairman, those are the  
2                   questions that I was going to ask arising out of the  
3                   Panel 9 witness statement. I would like to move on and  
4                   deal with the answer to the undertaking in relation to  
5                   clearcuts.

6                   Mr. Chairman, I believe that Mr. Mander  
7                   was given a copy of the materials which formed the  
8                   answer to this undertaking and what he should have been  
9                   given would be a package which contains basically a  
10                  number of historical documents which lead up to the  
11                  proposed clearcut policy of June, 1976.

12                  You should have --

13                  THE CHAIRMAN: I think we got one copy  
14                  last week, if I'm not mistaken. Did we give it an  
15                  exhibit number? I can't remember.

16                  MR. FREIDIN: No, we didn't. I don't  
17                  think anything was filed. You indicated that you  
18                  didn't receive a copy.

19                  THE CHAIRMAN: We will exhibit this  
20                  package, or not?

21                  MR. FREIDIN: Yes, I would like to  
22                  exhibit the package. There are, as I say, three sort  
23                  of bundles. I just want to make sure you got what I  
24                  understand according to me.

25                  There should be a document which is



1       entitled: Undertakings Panel IV which reproduces part  
2       of the transcript of August the 15th, 1988 and then  
3       there is a response starting on the second page of that  
4       document which covers four pages.

5               All right. So that is basically a  
6       reproduction of the undertaking and a response.

7               That response in fact summarizes a bundle  
8       of material which is referred to in the response  
9       starting with a document: Control of Logging Methods  
10      on Crown Lands dated December, 1971. And you should  
11      also have, as part of that answer, a paper authored by  
12      Mr. Armson dated December the 2nd, 1988 entitled:  
13      Clearcuts.

14              MS. SWENARCHUK: Are you saying Mr.  
15      Freidin that the numerous documents between the two are  
16      not part of the package that the Board has received?

17              MR. FREIDIN: Which documents?

18              MS. SWENARCHUK: After: Control of  
19      Logging Methods on Crown Lands, we then have Policy,  
20      then Instructions for Implementations.

21              MR. FREIDIN: Yes.

22              MS. SWENARCHUK: There are numerous...

23              MR. FREIDIN: I can go through them --  
24      all right, maybe I should for the purpose of the record  
25      make sure that they are all there.

1                   Control of Logging Methods on Crown Lands  
2   December, 1971 is the first document; the second  
3   document is a policy entitled: Control of Logging  
4   Methods on Crown Lands dated October the 6th, 1972; the  
5   next document is a document: Instructions for the  
6   Implementation of Circular TS 2.00.05.01 dated October  
7   the 6th, 1972; and a letter December the 2nd, 1974 --  
8   actually it is a memo from Mr. J. F. Flowers to  
9   regional foresters in the regions indicated which has  
10  an Appendix 1 attached.

11                   MS. SWENARCHUK: Excuse me, Mr. Freidin.  
12   Memo to Mr. Flowers from Dixon; right?

13                   MR. FREIDIN: No, the next one.

14                   MS. SWENARCHUK: Okay.

15                   MR. FREIDIN: The next one is December  
16   9th, 1974 letter from R. M. Dixon to J. F. Flowers  
17   entitled -- subject being control of clearcutting. The  
18   second page of that document starts listing a number of  
19   definitions, goes on for a number of pages.

20                   The next document should be a letter of  
21   December the 23rd, 1975 from Mr. Flowers to Mr.  
22   Robinson with an attachment; the attachment being:  
23   Proposed Policy for Controlling the size of Clearcuts  
24   in the Northern Forest Regions of Ontario, and the last  
25   document is a document dated June, 1976 and it is

1       entitled: Proposed Policy.

2                   I am sorry, is not the last document, the  
3       next document is June, '76 document entitled: Proposed  
4       Policy for Controlling the Size of Clearcuts in  
5       Northern Forest Regions of Ontario.

6                   MRS. KOVEN: We have a blank page for  
7       that, is that a copy where the June document...

8                   MR. MARTEL: I have a page missing. Is  
9       that the Armson policy?

10                  MR. FREIDIN: Do you have the report?

11                  MRS. KOVEN: Yes, we have those with the  
12       covering letter from Reynolds.

13                  MR. FREIDIN: Oh, the covering letter is  
14       dated July the 29th, 1976 where Mr. Reynolds sent that  
15       out to a number of people--

16                  MRS. KOVEN: Mm-hmm.

17                  MR. FREIDIN: --who are attached or  
18       listed. That is the last document.

19                  MRS. KOVEN: Okay. So this doesn't mean  
20       anything then, this June, '76...

21                  MR. FREIDIN: June, '76.

22                  MRS. KOVEN: Just a paper with  
23       handwriting on it.

24                  MR. FREIDIN: Have you got that document?

25                  MRS. KOVEN: That is the second page of

1 that.

2 MR. FREIDIN: It is says basically the  
3 same thing, June, '76.

4 MR. MARTEL: Is page 1 of the Armson  
5 document missing?

6 MR. FREIDIN: Page 1.

7 MR. MARTEL: Yes, I start at page 2.

8 MR. FREIDIN: Well, this is the paper  
9 authored by Mr. Armson which is entitled: Clearcuts?

10 MR. MARTEL: I don't know the name, I  
11 don't have a page 1.

12 MRS. KOVEN: That is a covering letter.

13 MR. MARTEL: I don't have it.

14 MS. SWENARCHUK: There is a page 1  
15 entitled: Clearcuts at the top December 2nd, '88.

16 MR. MARTEL: Oh.

17 THE CHAIRMAN: We don't have the one with  
18 the diagram on it.

19 MS. SWENARCHUK: I don't have one with a  
20 diagram either.

21 THE CHAIRMAN: I don't think it was part  
22 of the copy.

23 MR. FREIDIN: You haven't got the  
24 actual--

25 THE CHAIRMAN: No.



1 MR. FREIDIN: --the last document, the  
2 Proposed Policy?

3 MRS. KOVEN: Well, is that Mr. Armson's  
4 paper?

5 MR. FREIDIN: No.

6 MRS. KOVEN: No, we don't have that.

7 MR. FREIDIN: No, this is June, 1976  
8 document. You have just got a piece of paper that says  
9 June, '76.

10 THE CHAIRMAN: Right.

11 MR. FREIDIN: You should have received  
12 the actual document.

13 MS. SWENARCHUK: Do you have this then,  
14 the covering letter from Reynolds with the list of  
15 people who he sent it to.

16 THE CHAIRMAN: Yes.

17 MR. FREIDIN: Well, there was an  
18 exhibit -- maybe it was exhibited in Panel No. 4. Can  
19 I just have a moment to look at my exhibit list.

20 MS. SWENARCHUK: It is says Exhibit 157  
21 June, 1976 MNR Proposed Policy for Controlling the Size  
22 of Clearcuts, 157.

23 MR. FREIDIN: 157?

24 MS. SWENARCHUK: June, '76.

25 MR. FREIDIN: Well, Mr. Chairman, what I

1 can do, I can have some extra copies of that run off.  
2 The witness is not going to be referring specifically  
3 to that document in his evidence-in-chief in any event,  
4 so...

5 THE CHAIRMAN: So should we exhibit this  
6 whole package as Exhibit 419?

7 MS. SWENARCHUK: And the last document in  
8 the package is Mr. Armson's statement of last week of  
9 December 2nd, '88 on clearcuts.

10 MR. FREIDIN: Why don't we just give them  
11 three separate -- you can do the -- 419A could be the  
12 undertaking and the answer which includes -- or the  
13 response which includes all of the documents referred  
14 to; and 419B could be Mr. Armson's paper of December,  
15 the 2nd, 1988.

16 THE CHAIRMAN: What was the third exhibit  
17 going to be?

18 MR. FREIDIN: There won't be a third one.

19 THE CHAIRMAN: There won't be a third  
20 one.

21 ---EXHIBIT NO. 419A: Package of documents consisting  
22 of Undertakings Panel IV and  
responses thereto.

23 ---EXHIBIT NO. 419B: Paper of Kenneth Armson dated  
24 December 2, 1988 entitled:  
Clearcuts.

25 THE CHAIRMAN: Okay.

1                   MR. FREIDIN: Q. Mr. Armson, could you  
2           advise why the covering memo for the historical  
3           material was prepared and why your clearcut paper was  
4           included as part of the answer to this undertaking,  
5           since it is not the method that we have used in the  
6           past for dealing with undertakings, it is a little bit  
7           more elaborate and perhaps I would like you to comment  
8           on that.

9                   A. Well, I believe, as I indicated to  
10          the Board in Panel 2, there has been an evolution in  
11          terms of both management activities and, more  
12          particularly, harvesting activities and the  
13          relationship between harvesting and regeneration or  
14          renewal in terms of, both the activities and the  
15          responsibilities for those activities has been one that  
16          has been changing, and that the concerns that are  
17          evidenced by the material that is in this exhibit, more  
18          specifically the 1971 document, reflects to a large  
19          degree concerns by foresters within the Ministry then  
20          for the effects of harvesting when the industry at that  
21          time had no responsibility for it, for regeneration or  
22          timber management and there was in fact a much simpler  
23          planning process and these concerns, I think, became --  
24          well, were major ones for many of the foresters.

25                   In looking at addressing those concerns

1       they, I think rather simplistically but in a sense  
2       understandably, looked for something that could be  
3       controlled simply and I believe that they chose the  
4       size of clearcuts.

5                   I indicated to the Board, I was not of  
6       the opinion even at that time, but they were looking  
7       for something to control -- means of control and that  
8       seemed to be the most obvious one.

9                   We have, since that time, the early 70s  
10      evolved and, as I say, through our processes we have I  
11      believe addressed the matters that were of concern in a  
12      different way.

13                  Q.   And I think your evidence in relation  
14      to this issue was in Panel 4 as opposed to Panel 2, Mr.  
15      Armson?

16                  A.   I am sorry, yes.

17                  Q.   Now, you indicated that there was a  
18      concern beginning in the early 70s about clearcuts.  
19      And could you perhaps indicate what in fact initiated  
20      the concern back in the early 70s regarding the size of  
21      clearcuts which eventually led to the preparation of  
22      the proposed policy?

23                  A.   Well, the concern - and I did speak  
24      to this particular aspect in Panel 2 - was the  
25      mechanization of harvesting; that was point No. 1 that



1       came into play during the period, particularly of the  
2       late 50s but into the 1960s.

3                       And keeping in mind that from 1962 on to  
4       the period of the early 70s, mid-70s the industry had  
5       no obligation for other aspects other than those  
6       related to harvesting. So that the use of equipment  
7       and the extent to which that might be used not only in  
8       terms of area but also in terms of the season, and  
9       there were observations made by foresters in which they  
10      perceived often what they considered either damaging  
11      effects or negative effects and they related these back  
12      to the harvesting.

13                      MS. SWENARCHUK: Mr. Chairman, the Board  
14      will recall that Mr. Armson was not employed by the  
15      Ministry of Natural Resources during the time period of  
16      this document's preparation. Perhaps at a minimum, if  
17      he is going to testify to it he could identify for us  
18      his sources of information about the development of the  
19      policy.

20                      MR. ARMSON: If I...

21                      MR. FREIDIN: Q. Well, I think that Mr.  
22      Armson is indicating what the concern generally was  
23      within the forestry community but go ahead, Mr. Armson,  
24      if you feel you would like to address that.

25                      A. Well, if I heard the question

1 directly it was: To what degree did I have any basis  
2 for addressing this policy since I was not employed by  
3 the Ministry of Natural Resources.

4 MS. SWENARCHUK: No.

5 THE CHAIRMAN: No, how would you be in a  
6 position to testify on policy of the Ministry at that  
7 time when you yourself were not employed by the  
8 Ministry. Is that basically your question?

9 MS. SWENARCHUK: Nodding affirmatively).

10 MR. ARMSON: The individuals,  
11 particularly one of the authors of the proposed policy  
12 discussed the matter with me from time to time,  
13 actually quite considerably during the early 1970s and,  
14 as I did explain to the Board, when I was undertaking  
15 the year-long study of forest management in 1975-76 I  
16 was specifically asked to give my opinion at that time  
17 although I was not employed then by the Ministry on the  
18 proposed draft policy.

19 THE CHAIRMAN: And would you have had  
20 access to Ministry documents and that kind of thing  
21 during the course of your study?

22 MR. ARMSON: In the early 1970s I can't  
23 recollect whether I actually saw documents, but there  
24 was certainly discussion and I visited in the company  
25 of Mr. Robinson and Mr. Flowers in the early 1970s two

1 of the locations which they had in mind.

2 MR. FREIDIN: Q. I would ask you to  
3 continue with your evidence. You were indicating what  
4 led to this proposed policy and you were talking about  
5 concerns in the early 70s.

6 A. Well, the concerns were that there  
7 was visual evidence in terms of certain situations of  
8 what were considered to be lack of regeneration. I  
9 think that -- differences in growth which people  
10 attributed at that time to the size of the harvested  
11 area. There are -- a number of these items are  
12 specifically referred to in the 1971 publication, I  
13 think that is where they are specifically...

14 Q. Were there any concerns voiced in the  
15 early 70s regarding non-timber values and the  
16 relationship that they may have to clearcuts?

17 A. Yes. The document again refers  
18 particularly to wildlife in the study package.

19 Q. Sir, now sort of looking back into  
20 time, can you indicate whether the concerns in your  
21 view were in all respects valid?

22 A. No, in my opinion they were not  
23 valid -- the majority of them were not valid at all.

24 Q. All right. Were some of them,  
25 however, valid concerns in your view?

1                   A. The concerns were valid. I think  
2                   that what entered into it was the relating of those  
3                   concerns to a factor, in this case the size of  
4                   clearcut, which I believe was an erroneous assumption  
5                   to make in most instances.

6                   Q. Could you describe the concerns which  
7                   were voiced in the 70s -- early 70s over non-timber  
8                   values and how they might be affected by clearcutting?

9                   A. Yes. They were, as indicated in the  
10                  article or in the -- they were concerns primarily  
11                  related to the habitat for wildlife in general and this  
12                  particularly was a concern for both shelter and  
13                  appropriate types of vegetation for particular wildlife  
14                  species.

15                  It was dealt with rather generally,  
16                  referred primarily to moose and deer I believe, and  
17                  that was a very specific one. And the second area, as  
18                  I mentioned, was aesthetics and that was very generally  
19                  a visual element that they were dealing with.

20                  Q. And I understand that Dr. Euler will  
21                  in fact be addressing the issue of clearcut size and  
22                  what role or importance that plays in terms of wildlife  
23                  management?

24                  A. That is correct.

25                  Q. That will be in Panel No. 10?



1 A. That's correct.

2 Q. But that a little later on you will  
3 have some very general comments to make in that regard.

4 And in terms of the aesthetics, that as  
5 well will be dealt with generally by you but will be  
6 perhaps addressed more specifically by Mr. Clark in  
7 Panel No. 10?

8 A. That's right.

9 Q. You indicated that there was concern  
10 in terms of lack of regeneration and that there was  
11 certain differences in growth attributed to size of the  
12 area back in the early 70s.

13 Was any particular -- is there anything  
14 in particular which the foresters at that time believed  
15 was causing that lack of regeneration other than just  
16 the size of the clearcut itself? Was there anything  
17 happening or that they believed was happening in  
18 addition to just the size?

19 A. Well, in terms of regeneration there  
20 were concerns about the sources of seed, that when we  
21 were speaking primarily conifers, and of exposures.  
22 These were two areas that they focused on in a general  
23 sense.

24 Q. Why was it the size of the clearcut  
25 which was attracting the focus of attention?

1                   A. Because that was the most visible  
2                   entity that they observed and I would also suggest that  
3                   in that period of the late 1960s and early 1970s there  
4                   was a considerable concern, both in this country but  
5                   more particularly in the United States about clearcuts.

6                   It was a topic of a great deal of  
7                   attention and I think it not unnatural often that in  
8                   looking at a situation one often makes - rightly or  
9                   wrongly, sometimes wrongly - one draws a conclusion  
10                  about a cause and effect relationship on the basis of  
11                  what one sees rather than of in fact an understanding  
12                  of the processes.

13                  And I would suggest a good example in the  
14                  1971 document was their concern for soils, peat soils,  
15                  wet soils and their rather bald assumption that by  
16                  cutting off the vegetation almost exclusively you would  
17                  have a rise in the water table to the point that the  
18                  area would become less suitable and less productive in  
19                  terms of timber vegetation.

20                  And here again, as I explained to the  
21                  Board earlier, we have good evidence that for much of  
22                  the wetlands with productive stands that does not  
23                  happen and that has been documented in such documents  
24                  as the Forest Eco-System Classification.

25                  Q. Do you believe in retrospect, Mr.

1 Armson, that the size of clearcut, or whether the  
2 concern that the size of clearcut was having an adverse  
3 effect on productivity has been validated?

4 A. No, not from the documents that were  
5 available nor from documents since that time that I am  
6 aware of in any of the instances, for example, where  
7 there were examples of inadequate regeneration or of  
8 growth that was not considered appropriate for that  
9 particular area.

10 In looking for explanations other than  
11 the size of clearcut, one can usually find them in  
12 differences in soil, differences in seeding and  
13 seedbed, for example, which would give rise to  
14 differences in amounts of regeneration, aspect and; in  
15 other words, looking at those factors, specific factors  
16 rather than a rather general one of size of clearcut.

17 Q. I would like you to refer to the  
18 clearcut documentation 416A (sic) and particularly the  
19 1971 document entitled: Control of Logging Methods on  
20 Crown Lands. Do you have that one there in front of  
21 you?

22 A. Yes, I do.

23 Q. Now, I am wondering, Mr. Armson,  
24 could you by reference to that document advise how, if  
25 at all...

1 THE CHAIRMAN: What number was that?

2 MR. FREIDIN: 419 -- I'm sorry, 419A I  
3 might have said 16. It is the first document after the  
4 typed response. It is entitled: Control of Logging  
5 Methods on Crown Lands, December, 1971.

6 Q. And I don't think I want you to  
7 review every line and word, Mr. Armson, but could you  
8 by reference to that document advise how, if at all,  
9 the concerns voiced in the early 70s which played a  
10 role in or were motivating factors in the development  
11 of the proposed clearcut policy have been addressed by  
12 developments since that time or where knowledge  
13 acquired since that time addresses those concerns?

14 A. Yes, I can and I preface it by saying  
15 that one of the key manners in which I believe the  
16 concerns have been addressed, that is in the overall  
17 sense, is by the timber management planning process and  
18 all the factors related to it.

19 But I will now go to some of the  
20 specifics. On page 2 of the 1971 document, the second  
21 half of the page elaborates on a number -- begins the  
22 elaboration of a number of items.

23 First is termed site protection and it  
24 deals essentially with shallow soils and raw outcrops  
25 on steep slopes. There is a bald statement there that



1 "large clearcuts can result in extensive  
2 loss of soil or dessication and site  
3 productivity can be lowered and  
4 regeneration may be difficult or  
5 impossible to attain."

6 Now, very specifically, as the Board is aware, in the  
7 silvicultural guidelines - and an example that the  
8 Board has is the Spruce Silvicultural Guidelines -  
9 there is a very -- that document outlines on the basis  
10 of both scientific knowledge and experience what are  
11 the elements that should be taken into account in  
12 drawing up the silvicultural ground rules or  
13 prescriptions in relation to specific types of  
14 conditions broadly defined, and that relates to items  
15 of shallowness, items of productivity and regeneration.

16 So we have, if you like, a process in the  
17 system whereby the use -- and the use of those  
18 guidelines and with reference to them is mandatory in  
19 the development of those silvicultural ground rules.

20 The second part of that site protection,  
21 as I say, dealt with -- made a rather cavalier A  
22 assumption, I would say, about the water table and  
23 change in water levels and, as I say, we have a much  
24 better understanding and that is embodied in, for  
25 example, the Forest Eco-System Classification which

1 clearly identifies for the forester in the northern  
2 regions, specifically the Clay Belt where wet soils are  
3 very abundant, how to differentiate between soils and  
4 conditions where the water table -- the water  
5 conditions are relatively stagnant or static, and those  
6 where there is high movement of groundwater.

7 Q. Has there been any response in terms  
8 of equipment that addresses that particular matter?

9 A. Oh, yes. With the onset again of  
10 timber management planning and the involvement of the  
11 industry, one of the first and very major developments  
12 that occurred in 1980 was the requirement of high  
13 flotation tires for certain operations, particularly  
14 harvesting operations on these organic soils and wet  
15 soils during the frost-free season.

16 I think that was a major step forward,  
17 technological one in a way but it very much related to  
18 the fact that prior to that rutting -- deep rutting had  
19 occurred.

20 The second area of concern was that of  
21 regeneration and here the document itself really  
22 outlines the concerns; seed supply, seedbed, conditions  
23 of right moisture and temperature and these are all  
24 elements that, to a large degree, are not independent  
25 totally but cannot be directly related to some

1 particular dimension of a clearcut. Those are the  
2 important items.

3 The nature of the treatment that occurs  
4 on a cut-over area is probably far more important than  
5 the actual dimension or size of the area itself and  
6 certainly in relation to conditions and the objectives  
7 of management.

8 Again, really here what we are looking at  
9 are placing the harvesting system in the context of an  
10 overall planning process, we defined objectives and  
11 with very specific silvicultural prescriptions and  
12 ground rules as they apply to that particular  
13 management unit or area.

14 What the document discusses here is also  
15 a question of cost and the economics of some degree of  
16 natural versus artificial regeneration and where that  
17 can be undertaken which, in a sense, is dependent of  
18 the size of clearcut. What I am really saying is that  
19 in the policy relating to clearcut many of the items  
20 which are quite valid are really independent of that.

21 So to me that is again evidence of a  
22 proper concern and somehow it hung onto a size and an  
23 area control when, in fact, when you look at the  
24 document many of the concerns themselves are  
25 independent of area per se.

1                   The third area - and this is on page 4 -  
2                   deals with the concerns of wildlife habitat and  
3                   aesthetics and I think here I will suggest to the Board  
4                   that the guidelines, the Moose Guidelines, the Tourism  
5                   Guidelines, the process, the identification of areas of  
6                   concern, the whole management process with the  
7                   provision for input for other values, whether they be  
8                   wildlife or others, seems to me to be something that  
9                   addresses what are quite valid concerns here which, in  
10                  themselves again, don't necessarily relate exclusively  
11                  to clearcut size.

12                 Q.   Now, Mr. Armson, in Panel No. 4 the  
13                  witness statement was Exhibit 135 and at page 249 of  
14                  that document -- that witness statement there was a  
15                  table or a graph entitled:  Harvest Cut Versus  
16                  Regeneration Treatment on Crown Land.

17                 MR. FREIDIN:  I just want to ask Mr.  
18                  Armson a few questions about that.  I will just provide  
19                  people with a copy of that particular page so they can  
20                  follow along and it will refresh their memories, but I  
21                  don't think we have to exhibit this document.  (handed)

22                 THE CHAIRMAN:  Thank you.

23                 MR. FREIDIN:  Q.  Now, you recall dealing  
24                  with this -- you and Mr. Cary actually dealing with  
25                  this particular page of Exhibit 135?



1 A. Yes, I do.

2 Q. And the bottom line indicates the  
3 harvest cut in hectares for years indicated and the top  
4 line is the--

5 A. If I may...

6 Q. --I'm sorry, it is the other way  
7 around. Why don't we just go back, just give a brief  
8 explanation of what that document depicts?

9 A. The top line, which is a solid line  
10 with dots on it, is the level of harvest cut for the  
11 years 1974 through to 1986. The dots are for specific  
12 years of 1977, 1980, 1983, 1986 in addition to 1974.

13 The bottom line is again a solid line but  
14 it has a vertical mark on it for the same years and  
15 indicates the areas that have been given a regeneration  
16 treatment and those treatments were defined by Mr. Cary  
17 in Panel 4.

18 Q. And this particular document, do you  
19 recall whether it describes the amount -- the harvest  
20 for both even-aged and uneven-aged management or just  
21 one of the two?

22 A. This was for all treatments.

23 Q. So in fact then it will include areas  
24 which were not only clearcut but areas where selection  
25 cutting or other methods were used?

1 A. That's correct.

2 Q. The largest percentage in terms of  
3 silvicultural harvest method used, however, in the area  
4 of the undertaking is clearcut?

5 A. Yes.

6 Q. Could you just indicate what  
7 constitutes a regeneration treatment?

8 A. A regeneration treatment would be  
9 those activities where there was an artificial  
10 regeneration or a specific treatment in relation to  
11 site preparation, scarification, or natural seeding,  
12 these would be the major types of regeneration  
13 treatment; where there is an investment, in effect, of  
14 time and usually money to bring the stand back to a  
15 defined -- with a defined objective.

16 Q. We have heard I think in some  
17 evidence about areas being strip clearcuts and that  
18 would be a regeneration treatment?

19 A. That would be included.

20 Q. Okay. And would artificial  
21 regeneration be included?

22 A. That would be included.

23 Q. So that the area I think between the  
24 two lines, the bottom line and the top line, was  
25 described in Panel 4 as the area in hectares which

1 would have been harvested but which did not receive any  
2 regeneration treatment?

3 A. That's correct.

4 Q. And could you advise me what the  
5 areas which were cut using a clearcut silvicultural  
6 harvest method -- what those areas would look like sort  
7 of immediately after harvest if --

8 A. In general there would be two types.

9 Q. But these are the ones where there  
10 would be no regeneration treatment?

11 A. That's correct. We are speaking of  
12 no regeneration. One would be where the stand was  
13 essentially totally harvested, so that it would --  
14 there would be no standing trees, virtually no standing  
15 trees of commercial size.

16 There may well be residual vegetation,  
17 but the appearance would be one in which the forest had  
18 been taken off. There would be, of course in virtually  
19 all instances, residual vegetation, some of which might  
20 be small tree vegetation, some of which might be woody  
21 species or herbacious species. That is one of the  
22 conditions.

23 The second type of condition would be one  
24 that we would describe as clearcut where largely,  
25 because of not being commercially utilizable, either

1 individuals or more usually in the area of the  
2 undertaking parts of the stand would be left. The best  
3 example I can give to the Board would be in what we  
4 call a mixed wood stand, a fixed conifer and hardwoods,  
5 if they might visualize a stand of spruce or pine with  
6 mixed poplar and some birch in which the conifers are  
7 removed and the hardwoods are remaining.

8 So that when you look at it you would  
9 actually still see either a forest in a general pattern  
10 or clumps or portions of stands remaining. That would  
11 still be identified as a clearcut in terms of harvest.

12 Q. And both types of clearcuts would be  
13 included in this area between the two lines--

14 A. That's correct.

15 Q. --on page 249 of Exhibit 135?

16 A. Yes.

17 MR. FREIDIN: And those particular visual  
18 things will be -- you know, differences will be  
19 described in Panel No. 10 when Mr. Hynard gives his  
20 evidence on the various methods, Mr. Chairman.

21 Q. Without a seed source, how do the  
22 areas regenerate? These are the areas now where you  
23 use a clearcut method as you have described without a  
24 follow-up regeneration treatment?

25 A. Well, they will regenerate in a



1 number of ways and here I will speak only of the  
2 commercial tree species, obviously there are many  
3 species of plants which are already there.

4           The first is one I have already  
5 mentioned; that is, on a number of these areas the best  
6 example I can give the Board is a black spruce stand on  
7 an organic soil in which the stand is, let's say, 120  
8 or 130 years of age, it is probably opening up by  
9 natural causes, mortality, and in fact it is quite  
10 common to find advanced growth of black spruce which  
11 may be there either from seed which is disseminated  
12 over a period of time or, to a large degree on most  
13 sites, the lower branches of the spruce become rooted  
14 and take on the position of advanced growth and that  
15 may be anything from a few centimetres to a metre or  
16 two metres tall.

17           So that would be rather -- occur within  
18 that stand and would be in effect what we would call  
19 advanced growth already there. Some of that may or may  
20 not be damaged in harvesting. As I say, the use of  
21 high flotation tires has minimized almost to the point  
22 of being negligible.

23           The second situation would be where there  
24 is not advanced growth but where, over time, seeds  
25 would come into the area. The seeds of many of the

1       conifers are small, they are winged and they are  
2       distributed in the wind from certain species, not from  
3       others to any great degree, but there is an  
4       infiltration over time by seed from even quite long  
5       distances.

6                       The third way would be by vegetative  
7       reproduction, poplar in particular would sprout from a  
8       superficial root system and sucker up where it  
9       occurred. There are -- we know that there are seeds  
10      that are sometimes left in the soil over a period of  
11      years in which upon exposure to temperature and  
12      moisture will germinate the storage, in other words, of  
13      certain seed and soils, not so much perhaps within a  
14      tree species but certainly of other woody species can  
15      be for a very long period and then they germinate and  
16      grow.

17                      So that those would be the main means by  
18      which the area would regenerate.

19                      MR. FREIDIN: Now, Mr. Chairman, I should  
20      perhaps advise at this point that there was an  
21      interrogatory from Forests for Tomorrow asking about  
22      the maximum size of clearcuts occurring in Ontario. In  
23      one cut they asked -- they wanted that information and  
24      they also wanted to know what the maximum size of  
25      clearcut occurring in Ontario at the present time was

1 in a continuous cut.

2 There have been some preliminary  
3 discussions between Forests for Tomorrow and the  
4 Ministry regarding that particular interrogatory. The  
5 Ministry has indicated that there is some difficulty in  
6 fact identifying how one would actually go about trying  
7 to measure areas and come up with that answer.

8 But what I am really indicating is that  
9 we are hopeful that we will be able to come to an  
10 agreement on some sort of -- a methodology which is  
11 acceptable to address that and we will hopefully be in  
12 a position to answer that interrogatory in a number of  
13 months. We can't do that now.

14 I was hopeful to have a letter from the  
15 Ministry to Forests for Tomorrow just outlining  
16 basically the discussions to date. I may very well  
17 have that later today at which time I would be ask that  
18 I be allowed to file it.

19 Ms. Swenarchuk I think has indicated -  
20 and I think rightly so - that she would want to reserve  
21 rights to cross-examine witnesses based on the  
22 information that might come forth as a result of  
23 answering that undertaking and we certainly have no  
24 objection to that.

25 But one of the things that we might do is

1 be able to indicate what percentages of clearcuts fall  
2 into one category as opposed to another, whether it is  
3 the partial cut versus the cut where most of the  
4 vegetation is removed. We don't have that information  
5 now, it is information that we will be addressing in  
6 terms of whether in fact we can put together some  
7 numbers which will be helpful.

8 THE CHAIRMAN: Is that satisfactory?

9 MS. SWENARCHUK: Mr. Chairman, I just  
10 note that the delay is, you know, problematic in terms  
11 of cross-examining Panel 10 and I feel that you should  
12 vary the examining time to do that because, as I say,  
13 we won't be able to do that.

14 THE CHAIRMAN: Well, I think it has been  
15 noted that if it requires cross-examination and  
16 recalling of witnesses for that purpose, in this case  
17 it will probably be allowed.

18 MR. FREIDIN: Q. Now, Mr. Armson, in  
19 your paper on clearcuts, 419B, you make a distinction  
20 between certain types of -- situations where you don't  
21 have management objectives -- timber management  
22 objectives on the one hand and situations where you do  
23 have timber management objectives on the other.

24 And you refer to the situation -- that a  
25 situation can arise where you don't have them as



1 exploitation, you could describe some of the harvesting  
2 activities as exploitation but that wouldn't be the  
3 case if you had timber management objectives?

4 A. That is correct.

5 Q. Can you explain the significance of  
6 having timber management objectives as opposed to not  
7 having them and perhaps indicate whether, in fact, any  
8 of the evidence you have just given describing certain  
9 areas; this is harvest without regeneration treatments,  
10 has any relationship to that topic?

11 A. Yes, I will. By exploitation, I mean  
12 in this context the removal of trees or stands by  
13 harvesting in which the only criterion is really  
14 merchantability and that is it.

15 Under timber management we are looking  
16 not only to the harvesting but we are looking to the  
17 regrowth of vegetation on the area and, in so doing, we  
18 are making management decisions concerning how that  
19 tree regrowth will occur, where it will occur and how  
20 much, in terms of management input, will be invested to  
21 bring about the type of forest or conditions which have  
22 been decided as valid objectives to be obtain.

23 So that in that we -- and if I refer to  
24 this graph that you have in terms of the area in  
25 hectares of treatment versus total harvest, what we are

1 saying is that where there is a treatment, we are  
2 investing levels, it may be a relatively small amount  
3 or it may be a relatively large amount in terms of the  
4 attainment of the objectives for management.

5 The best example I can give you is on  
6 certain productive areas, keeping with the management  
7 objectives, the decision may be to harvest the stand,  
8 clearcut it, remove all the vegetation, site prepare  
9 it, plant it and tend it with a species which has been  
10 agreed upon as the objective and that would require a  
11 very extensive amount of investment.

12 Another area, because of the nature of the  
13 conditions, the existing forest and also management  
14 objectives might be dealt with with a relatively low  
15 investment and that would be a matter of relying upon  
16 either advanced growth or some minimal form of  
17 treatment to prepare a seedbed for natural regeneration  
18 of whatever, the stands or the trees that have been  
19 removed.

20 Now, we are coming very close to really  
21 what is the silvicultural treatment of clearcutting  
22 with no treatment, and there we are relying on two  
23 things, not only the management objectives which are  
24 defined, but the knowledge of the conditions of that  
25 particular area that is to be harvested with respect to

1 both the soil and, more particularly the existing stand  
2 and the surrounding forest in which that harvesting is  
3 going to take place.

4 And here I would suggest that in many  
5 instances we make a decision or a decision could be  
6 made where because of low productivity, natural  
7 productivity of the area, because of the manner in  
8 which it will revegetate, perhaps a rather lengthy  
9 revegetation period in terms of the forest cover, the  
10 decision may be to let it move through that natural  
11 cycle of revegetation and to treat it, in effect, as a  
12 lower class or lower productivity area and, therefore,  
13 not invest in it in terms of the types of regeneration  
14 treatments that I have previously mentioned.

15 In essence it becomes a matter of  
16 decisions concerning the levels of investment and the  
17 nature of the stands that are perceived to meet the  
18 management objectives.

19 Q. All right. If the factors which led  
20 to the concern regarding the size of the clearcuts have  
21 been addressed in the manner that you have described in  
22 your evidence, are there any concerns regarding site  
23 productivity or tree growth in Ontario conditions that  
24 would warrant restricting the size of clearcuts?

25 A. In my opinion, the size of clearcut

1 is not a factor to be addressed in terms of relating it  
2 to productivity.

3 Q. Are there situations where the  
4 attainment of management objectives might cause one to  
5 be concerned about the size of a clearcut?

6 A. Very definitely. Again, using an  
7 example from the Great Lakes/St. Lawrence Forest area,  
8 in terms of the regeneration of yellow birch, one of  
9 our species that has considerable value, there we rely  
10 normally in fact almost exclusively on natural  
11 regeneration and the position of the seed source and  
12 indeed the timing of the seed source, coincidence with  
13 the seed year, becomes a very critical factor as well  
14 as the nature of the seedbed.

15 So very clearly in those conditions and  
16 the prescriptions that would be written for that type  
17 of management, you would not have large clearcuts and  
18 that is not the case, they are normally a strip  
19 clearcut; they can be handled a number of ways, but  
20 certainly the last thing would be a large clearcut.  
21 But there I am relating it back to a management  
22 objectives, the type of stand and a decision as to a  
23 management -- in relation to management objectives.

24 Q. As a forester, Mr. Armson, are you  
25 aware of the concerns for other values, non-timber



1 values which relate to clearcutting?

2 A. Yes, I related -- previously  
3 indicated that in terms of other values in relation to  
4 wildlife, for example, the decision as to the leaving  
5 of parts of stands, as to the configuration of the  
6 cut - and I think this is much more of an appropriate  
7 concern - and as related to the configuration -- the  
8 distances between -- from the edge of the clearcut to  
9 some point within the clearcut become much more  
10 critical matters than the actual size, absolute area of  
11 the clearcut itself.

12 Q. Now, I understand that Dr. Euler will  
13 be in fact addressing again clearcut and its  
14 relationship to wildlife management.

15 A. Yes.

16 Q. But perhaps could you, perhaps  
17 through use of the flip chart, just provide the Board  
18 with some sense of what you mean when you say  
19 configuration is a more important factor than size  
20 alone and that distances to edge come into play; for  
21 instance in wildlife?

22 A. Yes. If I will, the example I will  
23 use and I will draw it on the board, is a clearcut that  
24 did not occur in this province, but it was a clearcut  
25 that I was particularly involved in, if you like,

1 designing in relation to what I think would be  
2 considered more aesthetic attributes than wildlife, But  
3 I think it will give the Board some sense of what I am  
4 discussing here.

5 This was a situation in New Brunswick in  
6 which a provincial highway ran through a large forested  
7 area and the forest conditions -- there was a drainage  
8 channel -- a stream that flowed through here. The  
9 lower part of the area was basically coniferous and the  
10 remainder of this area in here - if you can just  
11 visualize it - was essentially a hardwood forest with  
12 some conifer in it, but it was -- and in this case the  
13 owner of the property wished to in fact harvest the  
14 hardwood clearcut and in fact convert it into a, in  
15 this case, a coniferous stand.

16 And the concern -- this was rising up, if  
17 you like, a hill but because of the nature of the  
18 provincial highway he was concerned about what might be  
19 viewed as a large clearcut, the actual area to be  
20 clearcut was something of the order -- I'll draw you --  
21 of 700 or more hectares, it came down something like  
22 this.

23 I will start again. There is a stream in  
24 here, an area essentially of conifers on the lower  
25 slope, the hardwood. So what we decided to do was put

1 in a cut which was quite extensive but which had an  
2 opening in fact it came something like this. So that  
3 people coming along here in terms of their -- this was  
4 clearcut -- apart from -- in the first cut a strip of  
5 forest was left, if you like, as a screen but it wasn't  
6 left there permanently.

7 So this was a hardwood stand that was  
8 left as a screen along the highway, the cutting map  
9 operations went on behind here and the area, as I say,  
10 was something of the order of 700 acres and this then  
11 was planned, site prepared and planted with, in this  
12 case, spruce.

13 After the plantation had reached a size,  
14 after about five years - they would be of the order of  
15 head height, a very productive situation - then this  
16 area was removed, the screen was taken off -- there was  
17 actually a screen both sides - and this was planted.  
18 So that if you looked at a cross-section of the road,  
19 the visuals were young plantation here, but behind that  
20 was a taller stand, but the residual forest was left  
21 here so that when you looked at it you had a  
22 combination of both opening and young trees and taller  
23 trees.

24 Now, actually in the Tourism Guidelines  
25 and in some of the documents that the Ministry has in

1 terms of looking at designing cuts, this is the kind of  
2 a simple principle. There are many ways in which you  
3 can do this in particular.

4 If you talk about area, if you had an  
5 area limitation, then this couldn't be accomplished  
6 because the area -- let's say, you had an area -- a  
7 limit of 300 acres, that couldn't be done. And yet the  
8 concerns that were here were largely visual rather than  
9 in relation to wildlife habitat.

10 But using this example, what is the  
11 concern in terms of distance to edge. It may well be  
12 that that distance to edge was a concern that would  
13 have been reduced in size. So that, in essence, when  
14 you are looking at an existing stand you have to put it  
15 in the context and you are concerned about clearcutting  
16 it, you are not only looking at that stand and how you  
17 can configure the cut in relation to topography, but  
18 also in relation to existing stands around it.

19 And if you talk about controlling  
20 clearcut by a single dimension, area, then it misses  
21 the point on the context of both topography and  
22 residual stands or existing stands around it, and it  
23 misses also the point of what kind of configuration  
24 would best suit either visual or a value, let's say for  
25 deer or for other wildlife and, as I say, Dr. Euler may



1 speak to this.

2 But this is why absolute size in itself  
3 can be really not only constraining but can limit you  
4 in what you can achieve for other values.

5 THE CHAIRMAN: Mr. Freidin, can we  
6 approach the morning break at this time?

7 MR. FREIDIN: Two questions.

8 THE CHAIRMAN: All right.

9 MR. FREIDIN: Q. Before final decisions  
10 are made about the attributes that any particular  
11 clearcut will have, do persons who are or may be  
12 concerned with the non-timber values have an  
13 opportunity to have input in the decision-making?

14 A. Yes, they do and during the  
15 development of a timber management planning process  
16 they have very specific opportunities to address that.

17 Q. And I am not too sure a lot turns on  
18 it, Mr. Armson, but the size of the clearcut that you  
19 were personally involved in in this particular example  
20 was it 700 hectares or 700 acres?

21 A. No, it was 700 -- of the order of 700  
22 acres. I can't recall exactly.

23 Q. And what is the relationship between  
24 acres and hectares?

25 A. There are 24.7 acres in a hectare.

1 MR. FREIDIN: Those are my questions, Mr.  
2 Chairman.

3 THE CHAIRMAN: Thank you. Is that the  
4 completion of your direct examination?

5 MR. FREIDIN: Yes.

6 THE CHAIRMAN: Very well. Mr. Cosman,  
7 will you be ready to go after the break?

8 MR. COSMAN: Yes, Mr. Chairman. And  
9 perhaps I can ask people to bring back with them, if  
10 they don't have it, Exhibit 394 which is Statistics  
11 1987-1988.

12 THE CHAIRMAN: Okay. We will break until  
13 eleven o'clock.

14 Thank you.

15 ---Recess taken at 10:45 a.m.

16 ---Upon resuming at 11:05 a.m.

17 THE CHAIRMAN: Thank you. Be seated.

18 MR. FREIDIN: Mr. Chairman, I forgot to  
19 do a couple of things, housekeeping matters.

20 The letter which was marked Exhibit 417  
21 from Mr. Douglas to Mr. Drysdale, the one with no  
22 letterhead, I said that I would provide a copy to the  
23 Board with letterhead so I will do that, that is  
24 Exhibit 417. And I would also like to file the  
25 following.

1 THE CHAIRMAN: Have we got that? You  
2 haven't given it to us yet.

3 MR. FREIDIN: No. I will give it to you  
4 in a second. I would also like to file the following  
5 interrogatories.

6 THE CHAIRMAN: All right.

7 MR. FREIDIN: From Panel No. 9, Ministry  
8 of the Environment, No. 1 and No. 2; from Panel No. 10  
9 from the Ministry of the Environment, Question No. 8;  
10 and from Panel No. 10 from Forests for Tomorrow  
11 Interrogatory No. 6. So that would be what, Exhibit  
12 420?

13 THE CHAIRMAN: That's right, 420.

14 ---EXHIBIT NO. 420: Bundle of documents consisting of  
15 MOE Interrogatory No. 1 and 2  
16 (Panel No. 9); MOE Interrogatory  
17 No. 8; and Forests for Tomorrow  
Interrogatory No. 6 (Panel No.  
10).

18 MR. FREIDIN: Thank you, Mr. Chairman.

19 THE CHAIRMAN: Thank you.

20 Mr. Cosman?

21 MR. COSMAN: Thank you, Mr. Chairman.

22 CROSS-EXAMINATION BY MR. COSMAN:

23 Q. Now, Mr. Armson, there is one thing  
24 that we all know by now and that is that the forest is  
25 not static. We know that the forest and trees get old

1 and die, like all living organisms, and I think you  
2 have taught us that in the course of this hearing.

3 You have also informed us that on route  
4 to death they face large scale disturbances such as  
5 wild fire, blowdown, insects, disease.

6 And has this been going on, as far as we  
7 know, for some ten thousand years, since the ice  
8 receded?

9 A. To the best of our knowledge and I  
10 guess the use of logic, yes.

11 Q. We also know from your evidence that  
12 the forest itself burns over every - and I think you  
13 gave a range - but every 70 years, and I have a  
14 reference from Heinzelman '73; Woods & Day, 1977, van  
15 Wagner '78 that fire cycles in the boreal forest is 50  
16 to a hundred years.

17 So that is in the range that you were  
18 talking about?

19 A. That's correct.

20 Q. So that we know that for a  
21 10,000-year-old forest it is burnt once or twice a year  
22 for a hundred centuries?

23 A. That is another way of putting it.

24 Q. In other words, at the end of a  
25 hundred centuries we have a forest in place that has



1 regenerated following wild fire, blowdown, disease and  
2 harvest by man?

3 A. And insects.

4 Q. And insects. Is it reasonable and  
5 fair to say that after a hundred centuries there is no  
6 evidence that our forests in the area of the  
7 undertaking are not regenerating?

8 A. That's correct.

9 Q. And there is no evidence that the  
10 capability of the forest to regenerate in the area of  
11 the undertaking has been lessened by this harvesting,  
12 this harvesting by natural and man-made causes?

13 A. That is correct. If I were to  
14 qualify it by very limited areas, particularly by  
15 natural disturbance.

16 Q. Can you just elaborate on that?

17 A. Yes. Very limited areas where there  
18 has been a succession of wild fire, perhaps twice  
19 within 20 years, and it has limited the revegetation,  
20 not that it won't occur but it is much more limited,  
21 but that is the only qualification I would put.

22 Q. And apart from that, there is no  
23 evidence that the capability of the forest to  
24 regenerate has been lowered by this infrequent harvest,  
25 whether that harvest be by man or by natural cause?

1 A. That is correct.

2 Q. I would like to explore some of the  
3 magnitude of that harvest by nature compared to the  
4 harvest by man.

5 I think you have given some examples in  
6 the course of your evidence of the extent of wild fire  
7 and, in that regard, I think there was some reference  
8 at one point to the Thunder Bay Fire No. 46 which I am  
9 advised is the one in which some 126,747.7 hectares  
10 were burnt.

11 Were you familiar with that particular  
12 fire, if not that particular number by heart.

13 A. No, I am not familiar by heart, but I  
14 know that number and I am -- of the order of magnitude,  
15 but not precise.

16 Q. And to put this fire in the  
17 perspective of someone like myself from southern  
18 Ontario and perhaps a few others, if my mathematics is  
19 right, this is like burning 3,000 100-acre farms?

20 A. That would be about it.

21 Q. And that is for one single fire?

22 A. That's correct.

23 Q. Now, if you look at the various  
24 causes of premature death, if I may call it that, of  
25 the forest, there are various ways in which we, in our

1 society, keep track of that information and one of  
2 those ways is through the Canadian Forestry Services  
3 Survey Bulletin, I understand.

4 Are you familiar with that publication?

5 A. Yes, I am familiar with it in general  
6 terms.

7 Q. And this is a publication that I  
8 understand that is published three times a year. There  
9 is an issue in the spring which sets out predictions as  
10 to forest, insect and disease conditions in Ontario;  
11 there is a second issue in the summer which deals with  
12 defoliation; and there is a third and final issue in  
13 the fall which covers areas of mortality?

14 A. Yes, I am familiar with that.

15 Q. Yes. And I understand that the  
16 Survey Bulletin for the fall has just been issued and I  
17 put a copy before you.

18 MR. COSMAN: And I would tender that, Mr.  
19 Chairman, as the next exhibit.

20 THE CHAIRMAN: Very well. Exhibit 422.  
21 (sic)

22 ---EXHIBIT NO. 421: Fall publication of Canadian  
23 Forestry Services Survey  
Bulletin.

24 THE CHAIRMAN: Sorry, Mr. Cosman, I think  
25 that should be 421.

1 MR. COSMAN: Thank you, Mr. Chairman.

2 Q. Now, is that a photo on the cover of  
3 a clearcut, Mr. Armson?

4 A. The title says: Wind Damage in  
5 Ignace District, and the photograph has all the  
6 appearance of what we would call blowdown and that is a  
7 natural disturbance which has placed all the timber on  
8 the ground or virtually all the timber on the ground.

9 Q. All right. Now, may be some  
10 similarities in appearance to a clearcut but this is a  
11 photo of a blowdown?

12 A. Yes.

13 Q. All right. Now, I ask you to turn to  
14 page 1, just to start with, and you will see that in  
15 the first paragraph it describes -- this is being the  
16 final of three annual bulletins issued by the Forest  
17 Insect and Disease Survey Unit of the Great Lakes  
18 Forestry Centre, describing forest, insect and disease  
19 conditions in Ontario in 1988.

20 And the first major insect damage that is  
21 reported is under the spruce budworm and I would ask  
22 you to turn over to page 2 to the third paragraph.

23 Can you tell me whether it sets out there  
24 what the mortality -- pre-mortality for the spruce  
25 budworm was in the latter half of the 1988 field



1 season?

2 A. Yes. It specifically identifies  
3 448,637 hectares of new mortality in the northwestern  
4 and northcentral regions. So that the total recorded  
5 for the current outbreak is 14,515,719 hectares.

6 Q. All right. And then if I would ask  
7 you to turn over to page 4 - and I won't take you  
8 through each of the aspects of this document, even  
9 though it is the most current information - but on the  
10 top -- rather on the one, two, third, fourth paragraph  
11 of page 4, dealing with the jack pine budworm, can you  
12 tell us what it indicates the mortality increases have  
13 been for that particular insect?

14 A. Yes. It relates to two districts and  
15 the second sentence says:

16 "In Sudbury District the average  
17 mortality at five locations increased  
18 from 4.6 per cent in 1987 to 14.6 per  
19 cent in 1988. And the number of trees  
20 with bare tops increased from 4.6 to 9.6  
21 percentage at the same locations."

22 It then identifies:

23 "Increases also occurred under similar  
24 circumstances in Espanola District where  
25 records in four mortality plots showed an

1                   increase in average mortality from 14.3  
2                   to 16.8 per cent and an increase in bare  
3                   tops from 12.8 to 20 per cent."

4                   Q.   Would this be the latest reported  
5                   information in Ontario?

6                   A.   To my knowledge, this would be the  
7                   latest report.

8                   Q.   All right.  I would ask you to turn  
9                   to page 26, if you would, which deals with wind damage  
10                  and the Board on one of its site visits last July  
11                  actually did experience, as reported in the filing with  
12                  the Board, did see some example of a blowdown.

13                  But can you tell us what it says on page  
14                  26 with respect to wind damage in Ontario?

15                  A.   Well, in the first paragraph it  
16                  summarizes that:

17                  "In all some 26,426 hectares of damage  
18                  were mapped in the Red Lake, Dryden,  
19                  Sioux Lookout, Ignace, Fort Frances and  
20                  Thunder Bay Districts..."

21                  And then goes on to mention that:

22                  "Since then, additional areas of wind  
23                  damage, probably resulting from the same  
24                  storms that caused the damage described  
25                  above, were mapped in the northcentral

1                   and northwestern regions, bringing the  
2                   total area of damage in the two regions  
3                   to 32,811 hectares."

4                   Q. All right. Now, just using those as  
5                   examples of disease and wind damage, I would now ask  
6                   you to refer to Exhibit 394, if you would, which are  
7                   the specifics for 1987 and '88.

8                   And once again I just want to put in  
9                   perspective, if I can, the harvest by man and harvest  
10                  by natural cause, and I ask you to turn to page 12.

11                  Now, for the year ended March 31st, 1987  
12                  what is the total area in hectares that is shown as  
13                  having been harvested?

14                  A. Do you wish this number for Crown  
15                  land?

16                  Q. Yes, please.

17                  A. The total for Crown land is 201,869  
18                  hectares.

19                  Q. All right. And just for purposes of  
20                  comparison then, the total for both Crown land and  
21                  other land is what?

22                  A. 228,446 -- 464 hectares.

23                  Q. All right. Just keep that total in  
24                  mind, 228,000 and I would ask you to go to the same  
25                  report -- in the same report to page 77 and on pages 76

1 and 77 you have areas in hectare reported to have been  
2 the subject of fire damage from the years 1917 right up  
3 to the year 1987.

4 MR. COSMAN: Page 77, Mr. Chairman.

5 THE CHAIRMAN: Thank you.

6 MR. COSMAN: Q. Now, I won't go back to  
7 1917, but let's just take the modern period, if I can  
8 call it such, since 1980 to 1987, the FMA period and  
9 for the total hectares of areas burned over would be in  
10 the -- and there is different columns; there is damage  
11 in terms of dollars, private property damage, Crown and  
12 private areas with a total number of fires and areas  
13 per fire.

14 But I am just going to go to the total  
15 hectares area -- column which is the third column from  
16 the right and from 1980 to 1987 in those eight years -  
17 now, I have done the addition and if my addition is  
18 right, and just assume for purposes of my question that  
19 it is - in that eight years there are 1,530,000  
20 hectares that were burnt in those eight years which as  
21 an average comes to 191,000 hectares per year that was  
22 harvested by fire alone as an average.

23 And we have -- we already have the  
24 information as to what man has harvested and we have  
25 some indication of the harvest by wind and insect and



1 other natural causes. But I just wanted to put that in  
2 front of you and ask you whether or not that would give  
3 one a reasonable picture of the rough comparison of  
4 harvest by man and harvest by nature?

5 A. Yes, it does.

6 Q. Thank you. Now, you have already  
7 indicated in your evidence this morning that there is  
8 no whole-tree logging in Ontario?

9 A. That's correct.

10 Q. That is the logging in which roots  
11 and everything is taken out?

12 A. That is correct.

13 Q. And that just isn't done under our  
14 current practice?

15 A. Not to my knowledge.

16 Q. Yes. And you said last week in your  
17 evidence that there should be no absolute rule limiting  
18 full-tree logging even on shallow sites?

19 A. That is correct.

20 Q. Why, in your opinion, should there be  
21 no absolute rule limiting logging on shallow sites or  
22 in any particular area?

23 A. Because by merely using the word  
24 shallow you are only in fact, in a very simplistic  
25 manner, defining the situation. There is not only the

1 manner of the soil -- the shallowness but the degree of  
2 shallowness, the extent of the shallowness because  
3 often it is not uniform, in fact that is usually the  
4 situation, the nature of the bedrock and fracturing of  
5 the bedrock, which I have illustrated how that can be  
6 an important factor, and also the nature of the forest  
7 and the stand, the species mix that are there, as well  
8 as the management objectives for the area and for the  
9 particular stands and conditions which are being  
10 considered for logging.

11 Q. In fact, is it fair to say, Mr.  
12 Armson, that last week when you indicated that the  
13 words fragile or sensitive are perhaps used without a  
14 great deal of discipline -- rather without -- and that  
15 they don't mean very much without qualification, the  
16 same might be said about shallow?

17 A. That is correct.

18 Q. And by a shallow site you have to  
19 look at a number of different factors including, as you  
20 have indicated, not only the depth of the soil or the  
21 underlying structure of rock, but also the percentage  
22 of the area?

23 A. That is right, and very specifically  
24 the objectives of management of the species and the  
25 conditions that are present.

1 Q. All right. Now, last week you gave  
2 evidence with respect to hydrology and hydrogeology to  
3 a certain extent, and I would like to deal briefly with  
4 one of the aspects of erosion that you dealt with in  
5 your evidence.

6 And, as I understand it, that the  
7 variables that affect erosion are soil texture, slope,  
8 whether the forest floor is in tact and the input rate;  
9 would that be...

10 A. That's correct, that's right.

11 Q. All right. And in referring to one  
12 particular exhibit, Exhibit 418F I believe - although I  
13 don't think it is necessary to turn to it. If you  
14 would like to, if you have got a copy, that would be  
15 fine - but as I understand it, you indicated that if  
16 you remove the forest floor you could have a problem?

17 A. That is correct.

18 Q. And I believe this example came from  
19 the Clay Belt and I just wanted to get some general  
20 information from you as to the susceptibility of the  
21 Clay Belt to erosion. Am I right that clay is not  
22 highly erodible?

23 A. It can be eroded if it is exposed at  
24 the surface and particularly where there is a slope, a  
25 significant slope.

1                   Q. So there would be a number of factors  
2                   you have to consider before you actually say that clay  
3                   is or is not erodible. Slope you mentioned is one.  
4                   The nature of the soil itself is such that is it is not  
5                   highly erodible; is that true?

6                   A. It will surface erosion, it is a  
7                   sheet erosion, but again this is when the mineral soil  
8                   is exposed.

9                   Q. All right. And is it not true also  
10                  that in the Clay Belt you do have a thick forest floor?

11                  A. Yes, you do.

12                  Q. So that as long as that thick forest  
13                  floor is not removed, there is not likely to be a  
14                  problem of erosion in the Clay Belt?

15                  A. As long as the forest floor -- it  
16                  doesn't necessarily have to be thick, I would make that  
17                  clarification.

18                  Q. All right. So even -- so as long as  
19                  there is a forest floor itself without even a thick  
20                  forest floor, you are in a good situation?

21                  A. That's right.

22                  Q. Okay. Am I correct perhaps in  
23                  summarizing this area of evidence, in saying that apart  
24                  from specific particular situations that erosion is not  
25                  a problem generally in the area of the undertaking?



1                   A. I am not aware of that and with some  
2 considerable extensive viewing of the area of the  
3 undertaking.

4                   Q. You are not aware that it is a  
5 problem?

6                   A. That is correct.

7                   Q. Thank you. I want to come back to  
8 the forest floor. You had indicated in your evidence  
9 that you need to be careful not to remove the organic  
10 material that constitutes the forest floor and can you  
11 just summarize the reasons why that is so?

12                  A. Two reasons: The first is in effect  
13 the physical one related to water movement and, in  
14 particular, the possibility for surface erosion; and  
15 the second one relates particularly to an area of  
16 nutrient supply and more specifically to nitrogen  
17 supply to the revegetation -- the new vegetation that  
18 will come on that area.

19                  Q. In that latter respect you maintain  
20 the nutrient status of the soil by maintaining the  
21 forest floor?

22                  A. That is correct.

23                  Q. All right. Now, is it -- am I not  
24 correct that disturbing the forest floor in a  
25 controlled fashion through site preparation has

1 positive attributes for the forest?

2 A. Yes, that is correct.

3 Q. Is it fair to say that current forest  
4 management practice is not to remove organic material  
5 but rather to disturb it in that managed way I talked  
6 about during site preparation for regenerative  
7 practices?

8 A. Yes. And, in fact, the usual purpose  
9 is to expose limited areas of the mineral soil which  
10 can be more effective as either a seedbed for  
11 germinating seeds or as positioning for planted  
12 seedlings.

13 Q. So when you indicated in your  
14 evidence that there is a need to be careful not to  
15 remove organic material, you were not saying that there  
16 was a need to be careful not to disturb the organic  
17 material because, as you have indicated and clarified,  
18 that in effect is a positive thing?

19 A. In fact disturbance may be required.

20 Q. Now, I want to come back to what you  
21 said earlier in your evidence in this cross-examination  
22 when you indicated that apart from the situation of  
23 some fire, the soil -- or rather the forest's  
24 capability to regenerate has not been lessened by the  
25 infrequent harvests, man-made or natural.

1                   You indicated, as an example, the fire  
2                   that I believe which we heard also in your  
3                   evidence-in-chief, the second fire that comes along and  
4                   in some cases I understand can burn the soil right down  
5                   to the rock.

6                   A. Yes, that's correct.

7                   Q. So in certain situations then, in the  
8                   natural harvest that takes place, fire removes more  
9                   nutrients from the forest than harvest by man?

10                  A. It can, yes.

11                  Q. And clearcutting in a well managed  
12                  situation and the way it is practiced in Ontario has  
13                  less of an impact than natural clearcutting such as  
14                  fire, at least in those examples that you gave of fire  
15                  which goes beyond burning more than 50 per cent of the  
16                  organic layer?

17                  A. Yes.

18                  Q. So furthermore, in a well-managed  
19                  situation in terms of maintaining the nutrient balance  
20                  of the soil, there is less demand on the nutrient  
21                  budget in a managed regenerated forest than in an  
22                  overstocked forest; am I not right?

23                  A. In an overstocked forest?

24                  Q. One that isn't thinned, one that is  
25                  naturally grown, one that is not a man-made --

1 man-regenerated forest?

2 A. No, I would suggest that the nutrient  
3 demand, as in a naturally regenerated forest from a  
4 natural disturbance, and a comparable one in terms of  
5 species in situation following clearcutting, the  
6 nutrient demands could in fact be very similar.

7 Q. All right. So are there no occasions  
8 that you know of where the demand may be greater when  
9 the forest has naturally regenerated?

10 A. Well, there could be situations. I  
11 think here the -- I would not make that comparison. I  
12 think if I were making the comparison I would say that  
13 within the managed area there may be a decision to in  
14 fact increase the supply to the selected individuals  
15 and this was the example I referred to, was  
16 pre-commercial thinning in jack pine as a management  
17 process and thereby create, in effect, a productivity  
18 that was enhanced in terms of our management objective  
19 over the natural.

20 Q. I see. So in terms of demand on the  
21 nutrient budget, they would be comparable in your  
22 opinion?

23 A. That would be my position, yes.

24 Q. All right. But certainly not --  
25 there would not be more of a demand from a forest



1 regenerated after harvest by man than one after harvest  
2 by fire?

3 A. No, that would not be...

4 Q. So merely because you are  
5 regenerating after man-made harvest does not mean  
6 that you are putting a greater strain on the nutrient  
7 budget of the soil?

8 A. That is correct.

9 Q. All right. Now, I know we are going  
10 to get into the specifics of clearcutting in the next  
11 panel, but I just want to ask your opinion here today  
12 as a scientist whether, from the perspective of your  
13 training and education and practice as a scientist,  
14 whether clearcutting is a reasonable and  
15 environmentally acceptable method of harvest?

16 A. It is for a large part of the area of  
17 the undertaking.

18 Q. Thank you very much

19 MR. COSMAN: Those are my questions, Mr.  
20 Chairman.

21 THE CHAIRMAN: Thank you, Mr. Cosman.

22 Are you ready, Ms. Swenarchuk?

23 MS. SWENARCHUK: I am ready, but I could  
24 use a lunch break. I wasn't expecting to be on until  
25 tomorrow.

1 THE CHAIRMAN: You were expecting what,  
2 sorry?

3 MS. SWENARCHUK: I wasn't expecting to be  
4 on until tomorrow, but I will be ready to proceed after  
5 lunch.

6 THE CHAIRMAN: Okay. We will return at  
7 one o'clock then.

8 Thank you.

9 ---Luncheon recess taken at 11:35 a.m.

10 ---Upon resuming at 1:05 p.m.

11 THE CHAIRMAN: Thank you. Be seated,  
12 please.

13 MS. SWENARCHUK: Just before I begin, Mr.  
14 Chairman, I received this morning a package of material  
15 from the Ministry that I requested last week when I  
16 discovered it exists; namely, the responses that came  
17 back when the clearcutting policy was sent out for  
18 commentary in the '70s.

19 And if I arrive at a point of discussing  
20 the clearcutting policy today, I would certainly like  
21 to reserve until tomorrow cross-examination on that  
22 issue since I just received the material.

23 THE CHAIRMAN: Okay, that sounds  
24 reasonable.

25 Just before you continue, Ms. Swenarchuk,

1 we have been advised that the Federation of Anglers &  
2 Hunters is supposed to be sending a fax up to our  
3 office up here indicating that they want to  
4 cross-examine this panel.

5 In doing so, they will be unable to  
6 attend this week to do so. So just looking at the  
7 schedule that we have got before us, you will probably  
8 finish off some time tomorrow morning; would that be  
9 correct?

10 MS. SWENARCHUK: I expect so.

11 THE CHAIRMAN: And then, Ms. Seaborn, you  
12 indicated I think earlier that you might have a couple  
13 of hours?

14 MS. SEABORN: I think probably half a  
15 day.

16 THE CHAIRMAN: Half a day.

17 MS. SEABORN: But it won't be more than  
18 half a day.

19 THE CHAIRMAN: Okay. Now, in the event  
20 that we should complete your cross-examination  
21 tomorrow, one of the members of the panel would like,  
22 if possible, to attend an appointment tomorrow  
23 afternoon around two, and we have to fly out of here at  
24 four -- well, at 5:10 but we will probably leave for  
25 the airport shortly thereafter in any event.

1                   We have to continue next week if the  
2           Federation is going to cross-examine in any event, so  
3           it may be, Ms. Seaborn, if you don't finish tomorrow  
4           that you would finish first thing next week on Tuesday.

5                   MS. SEABORN: I think it is unlikely if I  
6           start mid-morning tomorrow when we finish, say, at one  
7           that I would finish tomorrow.

8                   THE CHAIRMAN: Okay. So then we would  
9           schedule you for next Tuesday and then carry on with  
10          the Federation from there and then go to re-examination  
11          by you, Mr. Freidin.

12                   So supposedly we would finish Panel 9 by  
13          next week for sure.

14                   MR. FREIDIN: Any indication as to how  
15          long they will be?

16                   THE CHAIRMAN: We haven't even received  
17          the official communication. Mr. Mander advises that  
18          they phoned but were sending some kind of fax that may  
19          give that indication. We will try and find out how  
20          long they intend to take as well.

21                   MR. FREIDIN: Any indication as to  
22          whether I should contact Mr. Armstrong or Mr. Williams?

23                   THE CHAIRMAN: No, I don't think at this  
24          point we have that information.

25                   MR. FREIDIN: Okay, thank you.



1 MS. SEABORN: Mr. Chairman, the only  
2 thing I would ask is if I start tomorrow I would like  
3 to finish on Tuesday rather than being interrupted by  
4 the Anglers & Hunters because I will be going out of  
5 order.

6 THE CHAIRMAN: That's right. No, I think  
7 that's reasonable. You will complete your  
8 cross-examination before they start theirs.

9 MS. SEABORN: Thank you.

10 THE CHAIRMAN: Thank you, Ms. Swenarchuk.

11 CROSS-EXAMINATION BY MS. SWENARCHUK:

12 Q. Mr. Armson, as you are aware, this  
13 panel is entitled: Silviculture and Forest Ecology  
14 and on page 16 of Panel 9 --

15 MS. SWENARCHUK: I should also indicate  
16 to the Board that not immediately but during my  
17 cross-examination I will also be referring to both  
18 volumes of Panel 10.

19 THE CHAIRMAN: Very well.

20 MS. SWENARCHUK: Q. On page 16, you have  
21 provided your definition of eco-system, if I can  
22 characterize it that way?

23 A. No, I would say I have provided  
24 Professor Tanslie's definition, I have just repeated  
25 it.

1 Q. Okay. This is a quote then from  
2 Tanslie's....

3 A. Yes, it is a quote both from Tanslie  
4 and also it is the definition that is employed in the  
5 forest terminology that is used throughout the world as  
6 the definition.

7 Q. Would you agree that Professor  
8 Kimmins is a recognized authority on forest ecology?

9 A. Yes.

10 Q. And I just want to explore for a time  
11 the variations in the definitions of forest eco-system.  
12 You would agree that there is a variation -- that there  
13 are variations?

14 A. Oh yes.

15 Q. Now, Professor Kimmins describes it  
16 thus, ecology that is:

17 "It has been given various definitions  
18 including scientific natural history, the  
19 study of the structure and function of  
20 nature, and the scientific study of  
21 the interactions that determine the  
22 distribution and abundance of organisms.  
23 The choice of definition is not critical  
24 as long as it is remembered that the  
25 focus of ecology is on the

1 interrelationships between living  
2 organisms and both their biotic, living  
3 and abiotic non-living environment."

4 Would you agree with that?

5 A. Yes, that is the definition of  
6 ecology.

7 Q. Yes.

8 A. On page 16 I am dealing with the word  
9 eco-system.

10 Q. Yes. You agree then that ecology is  
11 concerned with the interrelationships of organisms?

12 A. Yes, and the processes.

13 Q. And would you agree as well that an  
14 eco-system is a system in which there are  
15 interrelationships between organisms, living?

16 A. Yes.

17 Q. Yes. Now, on page 26 of his text  
18 Professor Kimmins talks about the term eco-system and  
19 he attributes to it six major attributes having to do  
20 with structure, function, complexity, interaction and  
21 dependency without any inherent definition of spacial  
22 dimensions and temporal change.

23 Would you agree that those are attributes  
24 of an eco-system for purposes of study?

25 A. I believe, yes, in listing those six

1       they would be attributes, yes.

2                       Q.   And then Kimmins goes on to say,  
3       again at page 26:

4                       "The importance of the eco-system concept  
5                       lies in its explicit recognition of  
6                       complexity, interaction and functional  
7                       processes. Its weakness lies in the  
8                       difficulty of using the concept for the  
9                       identification, mapping, description and  
10                      study of specific eco-systems because of  
11                      its failure to define their physical  
12                      boundaries."

13                     A.   I would agree.

14                     Q.   So it is possible then to deal with  
15       the concept of eco-system without attempting to deal  
16       with physical boundaries?

17                     A.   Correct.

18                     Q.   And you would agree then that  
19       according to this recognized authority its emphasis is  
20       on complexity and interrelationship?

21                     A.   Yes.

22                     Q.   Now, do you agree that an  
23       understanding of forest ecology and eco-systems is  
24       fundamental to a practice of silviculture and to sound  
25       forest management?



1 A. Yes.

2 Q. Do you agree that management of the  
3 forest requires management in line with eco-systems?

4 A. Management of the forest requires an  
5 understanding of the concept of eco-system.

6 Q. Okay. But you do not agree with  
7 forest management based on eco-system management?

8 A. No. One manages a resource, whether  
9 that be a forest or some tangible attribute of the  
10 forest which one has then to define, but the eco-system  
11 concept, as indicated by Professor Kimmins is a problem  
12 in that one can't draw neat lines around eco-systems  
13 per se and manage them as thus.

14 Q. But presumaby one can and should  
15 focus on the interrelationships between all the  
16 components of the eco-system in management?

17 A. In management, one probably focuses  
18 on a number of key relationships rather than all  
19 relationships.

20 Q. Isn't there a danger in doing that of  
21 failing to pay sufficient attention to various  
22 components of the eco-system?

23 A. The danger would lie in terms of not  
24 understanding the relationships in the generality and  
25 not being able to identify the ones that are perhaps

1 most sensitive or most likely to be disrupted in a way  
2 that is not intended.

3 Q. Could we look at Figure 2 of Panel 9  
4 on page 17?

5 A. Yes.

6 Q. Now, do you agree to start with that  
7 it is a fairly simplified picture of the ecology of a  
8 forest?

9 A. Very much so.

10 Q. And there are numerous elements of  
11 that eco-system which are not included in the drawing?

12 A. Yes, the flies are not in there for  
13 one thing.

14 Q. For example, wildlife including  
15 vertebrates and invertebrates above and below ground?

16 A. That is right. If I might, by using  
17 the word canopy and understorey and soil I was  
18 attempting to imply - and you are quite correct that it  
19 isn't all in there - but imply that it's the totality  
20 that is there.

21 Q. And would it not also have been  
22 helpful to identify in the scheme the decomposers which  
23 you have testified play an important role in the  
24 ecology of a forest?

25 In other words, in order to get a picture

1 of the ecology of the forest one should remember, in  
2 addition to what you have identified in this scheme for  
3 wildlife, for example, decomposers. Yes?

4 A. Well, I think the word soil -- the  
5 definition of soil embraces the totality of  
6 organic/inorganic living and dead material that is  
7 there. So without portraying everything in the  
8 picture, that was the intent.

9 Q. Now, you would agree that I believe  
10 that botanists have identified mycorrhizal fungi as  
11 having an important role in the utilization of  
12 nutrients and water by forest trees?

13 A. Of certain nutrients, water to a  
14 lesser degree, yes.

15 Q. And they are also then an important  
16 component of the ecology of the forest?

17 A. Yes, in our forest they are an  
18 inescapable component.

19 Q. Maybe you could spell mycorrhiza for  
20 the...

21 A. Yes. The spelling is  
22 m-y-c-o-r-r-h-i-z-a. Would you like me to explain what  
23 they are?

24 Q. Perhaps it would be helpful for the  
25 Board, yes.

1                   A. The mycorrhiza is a combination of  
2                   certain fungi and the root systems of certain plants.  
3                   In the forest that we have these are found particularly  
4                   with the spine roots of pines and spruces, also  
5                   hemlocks, but those are the key ones, maple so on.

6                   There is a combination -- the mycorrhiza  
7                   is a fungus root in a literal translation.

8                   Q. Now, I have attempted to underline  
9                   some of the other elements of ecology of the forest  
10                  which influence forest growth.

11                  You will be aware that most of the  
12                  Ministry witnesses to date have stressed the extensive  
13                  databases that exist within the Ministry, the currency  
14                  of knowledge utilized in decision-making, taking all  
15                  factors into account, particularly the scientific  
16                  literature.

17                  If we look at page 16, the last  
18                  paragraph, you have suggested that:

19                  "The need to be practical means that  
20                  where detailed knowledge is lacking and  
21                  often when it is not, decisions must be  
22                  made on a less detailed examination of  
23                  relationships and most probable impacts."  
24                  Then you have said on page 18, the last sentence of the  
25                  second paragraph, when you have been talking about



1 interrelationships in the forest processes:

2 "This specific knowledge will ensure a  
3 high probability that the more  
4 significant impacts of any activity will  
5 be identified than if the practitioner  
6 has to deal with all known relationships  
7 and attempt to take each into account."

8 Now, as I say, I consider this to be in contrast to  
9 what Ministry witnesses have indicated to date, but  
10 could you more specifically indicate to us, in your  
11 opinion, which known relationships can be dispensed  
12 with?

13 A. I am more concerned -- I would really  
14 be more concerned with what are the ones that cannot be  
15 dispensed with.

16 There is an infinite number of  
17 relationships that exist in a given forest at levels  
18 from the microscopic to submicroscopic to the macro  
19 levels. And, therefore, if we are talking about  
20 relationships, that magnitude of the numbers I think is  
21 what I am referring to here.

22 What one does is, in effect, identify the  
23 key relationships obviously in relation to management  
24 objectives. This is all set in the context of an area  
25 of land in which there are some defined objectives and

1       then, having defined the area of land, the basic entity  
2       which exists there in terms of the forest and organisms  
3       which enter into the, if you will, concerns about  
4       management and one proceeds.

5                       In that last paragraph what I am  
6       referring to is the interrelationships of the  
7       components there, whatever they may be, will have a  
8       bearing on management objectives as perceived in the  
9       broadest sense.

10                      Q.   Well, I think you underlined in your  
11       testimony earlier the elements of the eco-system that  
12       you consider essential and you basically focused on  
13       nutrient cycling and hydrologic cycling.

14                      A.   In terms of the vegetation  
15       particularly and then from that flow a sequence of  
16       other relationships.

17                      Q.   But can you tell us specifically:  
18       What relationships did you have in mind when you said  
19       it is possible to make decisions even when the  
20       information is available without consideration for  
21       those relationships?

22                      A.   Well, for example, let's return to  
23       the situation with mycorrhizas which we know in general  
24       exist, they are ubiquitous in our situation.  So  
25       decisions concerning the activities on forest trees can

1 be made, I believe, without really being concerned  
2 about the individual and specific relationships between  
3 the mycorrhizal fungus and the root of the trees that  
4 we are dealing with. I mean, that's an example, they  
5 are there...

6 Q. Might that not have a significant  
7 impact on the capacity to regenerate that site?

8 A. There is no evidence that it does in  
9 our conditions.

10 If one were rehabilitating mine-spoil  
11 waste in certain situations, then I would quite agree  
12 and there have been a number of examples where the  
13 knowledge of the interrelationships of mycorrhizal  
14 fungi and trees have been extremely important in the  
15 successive rehabilitation of those areas.

16 There is nothing to indicate that in our  
17 condition.

18 Q. There is nothing to indicate that the  
19 presence or absence of mycorrhiza influences  
20 regeneration?

21 A. Well, there is nothing -- I am sorry,  
22 there is nothing to indicate that they are absent. In  
23 fact they are ubiquitous, as I said.

24 Q. And a forest management practice  
25 which tended to damage or eliminate them could affect

1 future forest growth; could it not?

2 A. I am not aware of anything in the  
3 literature or any evidence that applies to the area of  
4 our undertaking where such a situation has existed or  
5 could exist.

6 Q. Okay. Are there any other  
7 relationships that you think can be dispensed with?

8 A. Well, I am not dispensing with it, I  
9 am saying that I can relegate that particular known  
10 relationship to something that doesn't enter into  
11 decision-making.

12 As I say, there are an infinite number of  
13 relationships out there and I am not dispensing with  
14 any of them, I am merely dealing with those that seem  
15 pertinent to the situation in which we are managing.

16 THE CHAIRMAN: Mr. Armson, when you are  
17 looking at decision-making in a practical sense, like  
18 how it is done.

19 MR. ARMSON: Yes?

20 THE CHAIRMAN: You don't necessarily go  
21 through a checklist; do you, when taking a look at a  
22 specific area. Do you in fact look at the area and the  
23 relationships or the detailed information that you feel  
24 you have to understand concerning the area, doesn't it  
25 assume sort of a hierarchy in the mind of the



1 professional that is making the decision?

2 Obviously, he will identify things that  
3 he feels need a lot of attention, other things he will  
4 assume, and other things he will study to a lesser  
5 degree. Isn't there this sort of hierarchical --

6 MR. ARMSOM: Very much so, Mr. Chairman,  
7 and this is really -- one deals with those elements and  
8 these may change from one location to another and  
9 change with management objectives. That's correct.

10 MS. SWENARCHUK: Q. Would you turn to  
11 page 10 of Panel 9, please. The second sentence of the  
12 second paragraph:

13 "In addition, the capability of a  
14 particular tree species to exhibit  
15 shallow or deep root characteristics can  
16 determine the degree to which it can  
17 exploit a given soil and location."

18 Now, would you not agree that there are other factors  
19 that will contribute to determining how well that  
20 species can exploit that particular location?

21 A. Oh, absolutely.

22 Q. Such as competition between species?

23 A. Yes.

24 Q. Regeneration strategies of species,  
25 the history of the particular site?

1 A. Yes, I agree.

2 Q. Okay. And on page 11 -- turn to page  
3 12, sorry. You have said that:

4 "Fire, wind, insects and disease  
5 separately or in combination have  
6 determined the spacial and age-class  
7 distribution of the existing forest."

8 Are those the only determinants?

9 A. They are the key ones in terms of the  
10 forest within the area of the undertaking.

11 Q. So are they more key than some of  
12 these additional factors which I want to identify;  
13 climate?

14 A. Well, the climate -- again, if I may  
15 use, there is a hierarchy here. Climate in an overall  
16 sense will determine the overall nature of vegetation,  
17 where we don't find palm trees or coc... and so on  
18 growing in this climate.

19 There are those. Yes, climate certainly.  
20 I am taking that as a given within the context of this  
21 statement.

22 Q. And I will just read through the rest  
23 of the list: micrometeorology, the physical and  
24 chemical composition of the soils, water supply and  
25 drainage, and inter-related biological factors.

1 A. Certainly.

2 Q. In other words, the Board should not  
3 look at that statement as defining, as it appears to  
4 state now, the spacial and age-class distribution--

5 A. No.

6 Q. --of the existing forest in isolation  
7 from other important factors?

8 A. That is correct. But I would submit  
9 that fire, wind, insects, and disease, and particularly  
10 the first three, have been the major factors in  
11 determining age-class distribution and, therefore, the  
12 space of that age-class and...

13 Q. Particularly you are saying fire,  
14 wind and insects?

15 A. Fire, wind and insects within the  
16 area of the undertaking.

17 Q. Now, on page 14 you speak about  
18 forest resilience. What exactly does forest resilience  
19 mean to you?

20 A. The ability of an area to withstand  
21 major disturbances, those I have mentioned in  
22 particular, but certainly man-caused disturbances, even  
23 to the building of roads and areas, that they are  
24 resilient in the sense that they come back to  
25 vegetation.

1 Q. So resilience refers to the capacity  
2 of the forest to revegetate after disturbance?

3 A. That's correct, that's the key  
4 meaning.

5 Q. Now, do you include in that the  
6 capacity to revegetate to the species that existed  
7 before the disturbance or not?

8 A. It could be either. I am not  
9 specifying that it would be that, in fact, in many  
10 instances it may not be.

11 Q. Okay. So it could be revegetation of  
12 a different species?

13 A. It could be revegetation, certainly  
14 with a different species.

15 Q. Now, do you agree that with respect  
16 to the resilience of a particular site that that  
17 resilience is a function of the nature of the stress  
18 applied and the specifics of the site such as soil,  
19 drainage, slope, climate, et cetera?

20 A. Yes, I would say that that describes  
21 it.

22 Q. And that any particular site is not  
23 infinitely resilient; that is, one simply cannot apply  
24 any matter of stress or manner of stress without  
25 eventual detrimental effects?



1                   A. There are some sites I would think  
2                   that it would be very difficult -- well, one would have  
3                   to define what one meant by detrimental; detrimental to  
4                   the society which is doing it, or detrimental to the  
5                   physical or biological nature of the condition.

6                   Again, I am not trying to --

7                   Q. I am saying detrimental to the, in  
8                   this case, physical or biological nature, to use your  
9                   words, of the site?

10                  A. Yes, certain -- and then again over  
11                  some timeframe, yes.

12                  Q. Detrimental to its capacity to  
13                  revegetate?

14                  A. Yes, particularly the speed and  
15                  timeframe over which it would revegetate.

16                  THE CHAIRMAN: But didn't we agree this  
17                  morning that eventually it will come back even though  
18                  it may be in a different species?

19                  MR. ARMSON: Oh, yes, but I think Ms.  
20                  Swenarchuk was saying there are some that are more  
21                  difficult and they may not revegetate as rapidly or  
22                  certainly in terms of species.

23                  Is that correct, Ms. Swenarchuk?

24                  MS. SWENARCHUK: Q. Well, is it your  
25                  position, Mr. Armson, that there are no sites within

1 the area of the undertaking which, if subjected to  
2 sufficient stress, will never revegetate?

3 A. No, I wouldn't be that categorical.  
4 But I think in terms -- in the context of the scale in  
5 which we are discussing the forest, those would be  
6 extremely minor examples.

7 If I might, I can think of a natural  
8 example: If beavers build a dam, they can flood an  
9 area and that isn't going to revegetate in terms of  
10 land base vegetation, so that's a change in the  
11 character of the land.

12 If we are talking about exposed soil, I  
13 presume that is -- I am a little unclear, you see, as  
14 to...

15 Q. This is my concern with your  
16 description of the forest as being resilient: It seems  
17 to me that you have failed to qualify that concept of  
18 resilience by the fact that subjecting any given site  
19 or piece of forest to a certain number and repetition  
20 and intensities of stresses may in fact very  
21 detrimentally affect the capacity of that forest to  
22 regenerate and that forests are not infinitely  
23 resilient nor are sites infinitely resilient.

24 A. Maybe not infinitely, but what I am  
25 saying very clearly I believe is that taking the area

1 of the undertaking and the vast -- the variety of  
2 forests and conditions that exist that in fact that  
3 forest, that totality of forest is extremely resilient  
4 as witnessed by the massive disturbances that it has  
5 undergone over many hundreds if not thousands of years.

6 Q. But focusing on the particular site,  
7 I merely want to make the point that any given site is  
8 not infinitely resilient?

9 A. There may be, yes, in fact there are  
10 situations where they are not infinitely resilient.

11 Q. Now, could we look at your Figure 3  
12 which is at page 20.

13 A. Yes, I have that.

14 Q. Now, would you agree with me  
15 initially that this is a forester's view of stages of  
16 tree development as opposed to, for example, an  
17 ecologist's view?

18 A. Oh, very definitely.

19 Q. That from an ecological perspective,  
20 for example, the first stage would be seed?

21 A. Yes.

22 Q. And from an ecological perspective  
23 what as you have described as juvenile, polewood and  
24 mature are all trees which have reached reproductive  
25 maturity and are really indistinguishable phases to an

1 ecologist?

2 A. No, I would not say they are  
3 indistinguishable phases in terms of seedling, juvenile  
4 polewood --

5 Q. No, no, I said juvenile, polewood and  
6 mature -- juvenile -- no, let's say polewood and  
7 mature.

8 A. Well, polewood and mature are quite  
9 distinct phases.

10 Q. In what sense?

11 A. Well...

12 Q. In an ecological sense?

13 A. In an ecological sense, oh very much  
14 so, in terms of the nature of the canopy, the  
15 dimensions of the trees in this case, since we are  
16 specifically talking about them, and in the nature  
17 usually of the root development between a polewood  
18 stand there is quite different -- obvious differences  
19 between the root system development which has a bearing  
20 on the soil.

21 Q. And this is differences that have to  
22 do essentially with size; is that right?

23 A. Well, no, it has also to do with some  
24 of the nature of processes and, in fact, what are  
25 referred to within here in terms of the state of demand



1 and supply in terms of moisture requirements, in terms  
2 of nutrients.

3 A polewood stand is normally a stand in  
4 which the tree canopy is in a very vigorous state of  
5 growth with a full canopy, it also has an impact on the  
6 lesser vegetation that would occur on that and,  
7 therefore, on the organisms that would use that type of  
8 a stand for habitat and also for other purposes, feed  
9 and so on.

10 When a stand is mature the dimensions  
11 have changed, the crowns have changed in terms of  
12 their -- not only their size but their intensity of  
13 foliage, and there is already in a mature stand a  
14 beginning of some of the individuals to in fact be less  
15 vigorous and die.

16 And I attempted to portray that merely by  
17 indicating that there are openings that occur in a  
18 mature which provide opportunities for other  
19 vegetation, maybe a tree there, but it could be woody  
20 shrubs and so on.

21 So there are very distinct differences in  
22 conditions between polewood stands and mature stands  
23 both not only in terms of the trees but also in terms  
24 of the associated vegetation in many species.

25 Q. And what about the concept of

1 overmature. Would you agree with me that that is  
2 largely a forester's measure of the point at which the  
3 quality of wood, the economic value of the wood begins  
4 to deteriorate?

5 A. It is used in that sense but it is  
6 also used by ecologists, my understanding, to indicate  
7 a vegetation which in terms of the conditions and the  
8 stage of development many of the individuals are in  
9 fact -- we would say, breaking up, they are in low  
10 state of vigor, they become much more vulnerable to  
11 diseases and they begin to -- the stand loses what we  
12 may use in forestry, this term, its integrity, it  
13 becomes much more ragged in development.

14 Q. Would you agree from the perspective  
15 of an ecologist the stage of overmaturity when the tree  
16 is beginning to die and eventually does die and release  
17 nutrients to the soil is as valuable a stage as any of  
18 the other stages; whereas to forester, because the  
19 quality of the wood has deteriorated, it is a less  
20 valuable stage?

21 A. Well, they are all valuable stages,  
22 I agree.

23 Q. But for purposes of forest management  
24 and harvesting, an overmature forest to a forester is  
25 of lesser value than a forest or stand that is not

1 overmature?

2 A. It may or may not depending on the  
3 species and I don't mean to -- but I think -- I agree  
4 that, generally speaking, an overmature stand is  
5 characterized by a lower utilizing of the volume of  
6 wood than one which is mature. That I would agree  
7 with.

8 THE CHAIRMAN: But an overmature stand or  
9 forest is not considered in both parlances, both the  
10 ecologist and the forester, as a healthy -- as the  
11 healthiest forest; is it?

12 MR. ARMSON: Well, I can't speak for the  
13 ecologist, but certainly the foresters would consider  
14 it a less healthy condition.

15 MS. SWENARCHUK: I think you will hear  
16 from ecologists, Mr. Chairman, that to an ecologist  
17 this is not an unhealthy condition, this is a natural  
18 stage of forest and species growth and decline -- and  
19 the decline is as essential to the recycling of  
20 nutrients as any other part of the process and there is  
21 nothing negative about overmaturity from an ecological  
22 point of view.

23 THE CHAIRMAN: Well, perhaps we will have  
24 to wait for the ecologist, but if you had a forest that  
25 was overmature for a large part of it without the

1 younger forest growing up behind it and revigorating  
2 what was there, even in ecology terms that wouldn't be  
3 as good a situation.

4 I guess what I am getting at: There has  
5 to be a proper mix; doesn't there, amongst all the  
6 stages including the overmature stage?

7 MS. SWENARCHUK: Well, I think that that  
8 question of what the mix is is precisely -- is a useful  
9 distinction to make and I think it is important to look  
10 at this document as -- this is six stages of tree  
11 development.

12 I think the ecologist would have some  
13 argument about whether an entire forest is likely to be  
14 overmature and lacking other newer growth.

15 So what I am attempting to focus on is  
16 the fact that when an individual tree - and this is  
17 about tree development - ages and becomes overmature  
18 the value of the wood for human use may decline in  
19 economic terms but the value of that tree which will  
20 presumably die and rot and contribute nutrients to the  
21 ground has not declined in ecological terms.

22 MRS. KOVEN: So in fact there is no  
23 conflict between the two if the decision is made simply  
24 to leave the overmature wood alone?

25 MS. SWENARCHUK: Well, if the position



1 being articulated is that overmature forest is not of a  
2 lesser economic value to a forester, then there is no  
3 conflict between the two.

4 But I think most foresters would agree  
5 that an overmature forest is less valuable; that is,  
6 the economic value of the wood has begun to decline as  
7 opposed to increase and that to a forester it is at the  
8 stage where it is less valuable.

9 MRS. KOVEN: But that is simply a  
10 disincentive not to cut it, I mean, given that the  
11 supply of wood isn't a problem?

12 MS. SWENARCHUK: Well, I am not the  
13 witness here.

14 Q. But wouldn't you agree with me, Mr.  
15 Armson, that in fact the contrary is true, that the  
16 attempt is made to liquidate the oldest forest rather  
17 than allow the wood to move into the phase of  
18 overmaturity and decline?

19 A. Well, it is where there is a decision  
20 not to harvest a particular overmature forest, and that  
21 may well be one -- an area of values in some specific  
22 location. But where one invests in silviculture to  
23 produce timber, one normally doesn't invest to produce  
24 an overmature forest.

25 Q. Exactly.

1                   A. And that would be somewhat of a  
2 contradiction, if the objective is timber.

3                   THE CHAIRMAN: But your investment -  
4 sorry, Ms. Swenarchuk - but your investment is to  
5 encourage growth in the first place?

6                   MR. ARMSON: That's correct.

7                   THE CHAIRMAN: So that you may have  
8 harvestable timber prior to it becoming overmature, in  
9 other words, more valuable and you can then cut it  
10 later on?

11                  MR. ARMSON: That is correct.

12                  THE CHAIRMAN: What I am trying to say  
13 is: If you didn't make that investment in the first  
14 place, you might well end up with an overmature forest.

15                  MR. ARMSON: And that is exactly what we  
16 have for a good part of the area of the undertaking  
17 right now. We are in fact right now harvesting  
18 overmature forest because it is there in abundance.

19                  MS. SWENARCHUK: Q. To look at it from  
20 another perspective, Mr. Armson, would you agree that  
21 what is to a forester an overmature forest could be to  
22 a botanist or naturalist or recreationist old growth of  
23 particularly high value?

24                  A. Oh, I can't speak to the values that  
25 other persons may put on it. I understand what you are

1 saying. How much value and so on is another matter.

2 Q. Well, for example, to use the  
3 forbidden Temagami word again, several hundred year  
4 old...

5 THE CHAIRMAN: It is not forbidden to us.

6 MS. SWENARCHUK: The 'T' word.

7 Q. Stands in the area which naturlists  
8 describe as being 200-, 300 years old and which they  
9 describe as old growth and which they, therefore, are  
10 attempting to preserve, are at the same time described  
11 by foresters or forest management companies as  
12 overmature timber which should be cut as soon as  
13 possible, I believe; is that not correct?

14 A. That is my understanding of the  
15 position, but I would also point out...

16 Q. I am not asking whether the position  
17 is valid, I am merely attempting to elucidate for the  
18 Board that the same tree may be overmature timber which  
19 should be cut to a forester but may be old growth and  
20 of extreme value for the purposes to other individuals?

21 A. That is correct.

22 Q. And part of what is that attribution  
23 of value from the non-forester is the ecological value  
24 of old growth?

25 A. Well, as I say, I can't speak to the

1 value in terms of the amount -- I really don't know.  
2 It is a value in the eye of the person who is looking  
3 at it.

4 Q. Exactly.

5 A. And how they value it, it is a  
6 another matter.

7 MRS. KOVEN: Within that situation the  
8 foresters -- forest companies aren't cutting down the  
9 trees because they are worthless, they are cutting down  
10 the trees because they have economic value; they are  
11 not cutting them down simply to level the forest and  
12 start over with planting. They are overmature, but  
13 they are valuable and that is why they want to cut  
14 them.

15 MS. SWENARCHUK: Yes, and specifically...

16 MRS. KOVEN: Although there are other  
17 values held by others...

18 MRS. KOVEN: But specifically with  
19 respect to what is characterized as overmature the  
20 forester will want to - Mr. Armson will correct me if  
21 I'm wrong - will want to cut that before it further  
22 declines in value; whereas to the recreationist  
23 basically the longer it lives the more valuable it is.

24 THE CHAIRMAN: But there is even an end  
25 to that; isn't there, Ms. Swenarchuk, that when it



1 lives too long it falls over and dies.

2 MS. SWENARCHUK: Yes. That is not a  
3 negative effect, however, to someone who is valuing the  
4 land for its natural processes. In fact it is accepted  
5 that at some point that 200-year-old pine too is going  
6 to die.

7 Q. Could we turn to your page 25,  
8 please, Mr. Armson, your Figure 6. Now, these are  
9 drawings of unmanaged and managed forest and would you  
10 agree with me that from the two drawings the managed  
11 forest definitely appears more productive?

12 A. Yes.

13 Q. And is it your position that the  
14 unmanaged forest is characteristically barren as  
15 compared to a managed forest; that is, trees with lower  
16 densities?

17 A. Barren?

18 Q. Yes.

19 A. No, it's not barren.

20 Q. So if one -- as compared to a managed  
21 forest?

22 A. No, I wouldn't use the word barren.

23 Q. Okay. Now, would you agree also that  
24 the competition between species means that unmanaged  
25 forests are not necessarily open, and I am going to say

1 barren, as depicted here relative to managed forests?

2 A. Well, I didn't mean that there was no  
3 intention to depict it as barren.

4 Q. That is what I was attempting to  
5 clarify.

6 A. No, the portrayal of the unmanaged  
7 forest in Figure 6 was to show a variety of age-classes  
8 and sizes, some very old trees. It is very typical of  
9 areas forested, have not been managed and to illustrate  
10 by comparison that in terms of management for timber  
11 production - and I make this very clear, that we are  
12 talking about management for timber production - there  
13 is what I would refer to as an integrity of the stand.

14 There is some diversity of species, but  
15 it represents, if you like, a forest which, as you have  
16 said, is more productive and contains the species which  
17 are considered most desirable.

18 Q. More productive for purposes of  
19 timber management?

20 A. Oh, yes.

21 Q. But not necessarily more productive  
22 in terms of biological productivity?

23 A. That may or may not be the case  
24 depending on the other organisms that are involved.

25 MS. SWENARCHUK: If I can just a have

1 moment, Mr. Chairman.

2 THE CHAIRMAN: Mr. Armson, while we are  
3 on this break for a moment, did you not indicate - and  
4 I can't recall if it was you or not as the witness -  
5 but did somebody not indicate - perhaps it was you -  
6 that the recent fire damage to the Yellowstone Park as  
7 an example in the U.S., notwithstanding that lumbering  
8 is not -- or harvesting is not allowed within the park,  
9 that it will, within a reasonable timeframe, come back  
10 as a healthier forest than what was there prior to the  
11 fire because a lot of it was overmature?

12 And that is a case where that area is not  
13 being used for harvesting purposes, it is solely for  
14 other values such as aesthetic values, wildlife, et  
15 cetera, et cetera.

16 MR. ARMSON: Mr. Chairman, I certainly I  
17 don't believe it was myself. I have no personal  
18 knowledge of Yellowstone. I obviously followed the  
19 discussion since the fire, but I don't believe I can  
20 remark on it.

21 THE CHAIRMAN: Thank you.

22 MS. SWENARCHUK: I think you will hear  
23 further discussion, Mr. Chairman, on the effects on  
24 forest health, you can say, and regeneration of fire,  
25 fire suppression, timber management. That may answer

1 the Yellowstone example as well.

2 THE CHAIRMAN: Fine.

3 MS. SWENARCHUK: Q. I appear not to have  
4 my notes from your testimony last week, Mr. Armson.  
5 Let me just ask you one question. You have indicated I  
6 think that species of the boreal forest are well  
7 adapted to regenerate after clearcutting?

8 A. That is correct.

9 Q. Now, I would like to ask you  
10 specifically about black spruce, jack pine and white  
11 spruce, and could you indicate for us for each species  
12 how specifically that species is adapted to  
13 regenerating after clearcutting?

14 A. Okay.

15 Q. Let's start with black spruce.

16 A. With black spruce. Black spruce  
17 normally occurs after a major disturbance, so  
18 clearcutting is a major disturbance. One may...

19 Q. Excuse me. Would you agree that the  
20 major disturbance after which black spruce normally  
21 occurs is fire?

22 A. That's correct.

23 Q. All right.

24 A. When there is clearcutting the  
25 seeds -- first of all, the cones of black spruce remain



1 on the tree - we are speaking of a mature forest and  
2 even an overmature perhaps - but the cones are retained  
3 for some considerable years and the seed is released  
4 gradually in contrast to jack pine where normally, in  
5 the boreal forest, the heat of fire or of -- heat on  
6 the mineral soil surface is necessary to open it - the  
7 black spruce cones do open to a degree and release  
8 seeds. So they can fly through the air and is released  
9 from adjacent stands or groups of trees.

10 So that in clearcutting one of the forms  
11 of clearcutting would rely on existing seed sources  
12 from surrounding trees or clumps of trees left within  
13 the stand, in that sense, making use of the seed  
14 supply, so that --

15 Does that answer your question concerning  
16 black spruce?

17 Q. Well, is there any other way that you  
18 would identify for us that black spruce is adapted to  
19 regenerating after clearcutting?

20 A. On organic soils - and I think I  
21 mentioned earlier black spruce has the characteristic  
22 of forming layerings. This is particularly important  
23 in actually overmature stands that are being harvested  
24 where there is an advanced growth from these lower  
25 branches which have become rooted and form the second

1 stand in effect. So that is...

2 Q. And do you have anything to add to  
3 what you said about jack pine?

4 A. With jack pine the normal way of  
5 regenerating there is, you can't really rely on the  
6 seed from standing trees not unless the fire goes  
7 through. That isn't usually the situation although  
8 there have been some experimental use of it in  
9 Michigan.

10 The normal situation is to either rely on  
11 cones on the mineral soil and this is -- exposed  
12 mineral surface may be brought about by site  
13 preparation, and the cones open and the heat from the  
14 sun on the surface soil, that provides seed source.  
15 More normally it is by applying direct seeding,  
16 actually collecting the cones -- the closed cones from  
17 the felled trees, exacting the seed and then reapplying  
18 it to those areas again or by planting.

19 But the essence is to have essentially a  
20 very open area in the cut-over for that.

21 Q. But presume -- you have referred to  
22 planting and seeding. Are you suggesting then the jack  
23 pine is not adapted to regenerating in open clearcut  
24 areas without artificial regeneration techniques?

25 A. Without assistance of some kind

1 because it normally relies on that major disturbance,  
2 in this case fire. Without fire, natural stands don't  
3 regenerate very well.

4 Q. And what about white spruce?

5 A. White spruce is a little different  
6 because it is a species that is found sometimes in a  
7 mixture with the other tree but more frequently in the  
8 area of the undertaking found mixed with hardwood  
9 species, particularly poplar and white birch.

10 Its cones are produced periodically in  
11 terms of major crops and the seed is then dispersed the  
12 year of maturity of the cones. It is not, therefore,  
13 well adapted -- in fact it is not adapted to the  
14 clearcut system per se as a natural species because in  
15 open -- large openings where it is common to have late  
16 spring frost white spruce can be damaged, it isn't  
17 normally killed, so that the leader growth in the early  
18 spring is killed and you have -- essentially what you  
19 see is a bushiness of the spruce.

20 So open clearcutting and then planting or  
21 in fact seeding, although there is visually none of  
22 that done, would not be the normal way to do it unless  
23 there were particular conditions where you do not have  
24 late spring frost or where you can control the time of  
25 bud break.

1                   And I believe I used an example last week  
2           of that on a northerly or northeasterly aspect as  
3           possible to plant white spruce in a large opening and  
4           minimize the amount of the late spring frost damage.

5                   But it is not a species that naturally  
6           occurs in a large stand after a major disturbance, it  
7           is usually intermingled through the mixed wood stands.

8                   MS. SWENARCHUK: I don't know how long  
9           you plan to sit today, Mr. Chairman, or whether you  
10          plan a mid-afternoon break, but I am moving on to a  
11          totally new area now.

12                  THE CHAIRMAN: Well, we will probably sit  
13          until about five, but I think we can probably go until  
14          about 2:30 or a quarter to three before we have a  
15          break.

16                  MS. SWENARCHUK: Okay.

17                  Q. I want to deal now, Mr. Armson, with  
18          the studies regarding nutrient cycling and nutrient  
19          depletion after full-tree harvest that you referred to  
20          last week. And if my memory serves me correctly I  
21          believe your conclusion was that one out of the five  
22          studies made recommendations against the use of  
23          full-tree harvest.

24                  A. That is correct.

25                  Q. Namely the Timmer study, and that the



1 other studies do not make such recommendations?

2 A. Yes, that's correct.

3 Q. And that your conclusion from the  
4 studies overall was that there is no indication that  
5 full-tree harvesting should be limited on boreal sites;  
6 is that correct?

7 A. I believe I said there were some  
8 sites that one would look carefully at for a variety of  
9 reasons. I don't think there was any intent to suggest  
10 it would be totally unlimited.

11 Q. All right. I would like to take a  
12 look at those studies in more detail then.

13 The summary of the studies referred to is  
14 on page 225 of Volume I of Panel 10 and the first study  
15 you referred to there is Weetman and Webber--

16 A. Yes, that is the -- correct.

17 Q. --1972 and I assume you reviewed this  
18 study before your testimony last week?

19 A. Yes.

20 MS. SWENARCHUK: I have copies for the  
21 Board. (handed)

22 THE CHAIRMAN: Thank you. This will be  
23 Exhibit 422.

24 ---EXHIBIT NO. 422: Paper entitled: The Influence of  
25 Wood Harvesting on the Nutrient  
Status of Two Spruce Stands, by

1 G.F. Weetman and B. Webber.

2 MS. SWENARCHUK: I intend to take some  
3 time and go through these studies rather in some  
4 detail, Mr. Chairman.

5 Q. Mr. Armson, this study I believe is a  
6 study that looked at stands of black spruce and red  
7 spruce and balsam fir on Quebec sites; is that right?

8 A. Yes.

9 Q. And the rotation period involved here  
10 was a 50-year rotation; is that right?

11 A. Well, these were natural stands. I  
12 am not -- the...

13 Q. At page 367, what I mean is that the  
14 authors concluded that a 50-year rotation could be  
15 supported. Page 367.

16 A. Yes.

17 Q. Last column:

18 "With certain exceptions, it appears that  
19 most of the till soils of the Canadian  
20 Shield and the Appalachian region..."

21 This is page 367, the right-hand column at the top:

22 "...the till soils in the Canadian Shield  
23 and Appalachian region are  
24 mineralogically rich enough and have  
25 enough cation-exchange capacity to

1 support the nutrient losses associated  
2 with one full-tree logging operation in  
3 each 50-year rotation. However, this  
4 statement cannot be applied with  
5 confidence to forests of the same regions  
6 growing on coarse waterlain deposits with  
7 low cation-exchange capacity, nor can it  
8 be applied to forests growing on  
9 organic-matter accumulations with very  
10 shallow rooting and no inputs of  
11 nutrients from lateral water movement.  
12 In order to make up for nutrient losses  
13 in logging on these latter sites, the  
14 addition of one or more of these  
15 nutrients along with nitrogen may be  
16 required."

17 A. Yes, I see that. I am aware of that  
18 statement.

19 Q. So the authors concluded that there  
20 were some sites on which full-tree logging on a 50-year  
21 rotation would be a problem?

22 A. They said that there was a degree of  
23 confidence that could be used and they used 50-year  
24 rotation and -- those are two factors that I think have  
25 to be taken into account in this statement, very

1 clearly. They are also applying the data from a  
2 natural stand to a "future managed stand" with an  
3 assumed rotation. That is the point I am making.

4 Q. Yes. I will come back to that.  
5 Could we look at page 366 for a moment, and it is the  
6 second full paragraph on the left-hand column:

7 "To us, the review of the literature and  
8 these calculations would seem to indicate  
9 an optimistic viewpoint regarding  
10 replacement of full-tree logging losses  
11 on fertile sites. However, on poorer  
12 sites, particularly those with dry humus  
13 layers or with very shallow wet organic  
14 soils, such an optimistic viewpoint does  
15 not seem warranted. On such sites,  
16 nutrient reserves are lower and there is  
17 a greater dependency on nutrient input in  
18 dust, precipitation and lateral water  
19 movements."

20 A. Yes, I have that line.

21 MR. FREIDIN: Sorry, what page are you  
22 referring to?

23 MS. SWENARCHUK: That's page 366.

24 Oh, yes. Mr. Chairman, this was copied  
25 after being highlighted and exactly the relevant



1 sections, I am afraid, do not come through clearly and  
2 what I will have to do is provide the Board and parties  
3 with a more clear copy at some later date.

4 Q. Would you agree with me, though, Mr.  
5 Armson, that the passage that I just read indicates  
6 again the concern of these authors with regard to  
7 full-tree logging on certain types of sites?

8 A. Yes, but in that same paragraph, the  
9 next sentence but one says:

10 "Obviously many more detailed studies of  
11 all the nutrient cycle components of  
12 individual eco-systems need to be made  
13 before firm conclusions can be drawn."

14 Q. Yes, before firm conclusions can be  
15 drawn. And certainly you discussed last week the  
16 variety of studies.

17 A. Yes.

18 Q. However, as these studies are done,  
19 this was a 1972 paper, do you not agree that some  
20 concern for certain types of sites has been identified?

21 A. Oh yes, I agree.

22 Q. The next paper you referred to on  
23 page 225 is one by Freedman and Duinker, and I think  
24 you will agree with me that that was a Nova Scotia  
25 study?

1 A. That is correct.

2 Q. And probably less applicable to  
3 Ontario, so we won't bother going through that. And  
4 the next one was Van Cleve and that was an Alaska  
5 study?

6 A. That's correct.

7 Q. Also more removed from Ontario.  
8 Could we look then at the Gordon, 1983 study.

9 THE CHAIRMAN: That will be Exhibit 423.

10 ---EXHIBIT NO. 423: Document entitled: Nutrient  
11 Cycling Dynamics in Differing  
12 Spruce and Mixedwood Ecosystems in  
13 Ontario and the Effects of  
Nutrient Removals Through  
Harvesting by Alan G. Gordon,  
dated 1983.

14 MS. SWENARCHUK: Q. Now, Mr. Armson, at  
15 pages 98 and 99 -- Mr. Gordon is a research scientist  
16 for the Ministry; is he not, in Sault Ste. Marie?

17 A. Yes, that is correct.

18 Q. He identified the various sites  
19 studied as being two mixed wood sites, two spruce sites  
20 and a red spruce site?

21 A. Yes, that's correct.

22 Q. And then at page 102, the sixth  
23 paragraph on the left-hand column, the last sentence in  
24 this paragraph:

25 "If total reserves are considered which

1 include the mineral soil mass, only black  
2 spruce site on peat support a crop in  
3 which the biomass is still nearly as  
4 great as in the reserves. This could  
5 make these sites particularly vulnerable  
6 to full-tree harvesting. It should be  
7 remembered that reserves in peat are only  
8 applicable to forest growth down to the  
9 water table. "

10 And at page 106, the bottom paragraph on the left-hand  
11 side:

12 "On the other hand, phosphorus in both  
13 black spruce sites and potassium in all  
14 sites but one of the mixedwood  
15 sites was greater in the standing crop  
16 than in the soil reserves. It is in  
17 these sites with lower nutrient  
18 reserves in the soil than in the standing  
19 crop that we might expect future  
20 nutrient stress following harvesting by  
21 full-tree logging."

22 At page 112, in the first paragraph on the left, the  
23 last sentence, there is a reference to the Weetman and  
24 Webber article we just looked at.

25 A. Yes.

1 Q. "Weetman and Webber (1972) however,  
2 cautioned that most of the available  
3 nitrogen for the next tree crop  
4 comes from decomposition of logging  
5 slash. This is particularly true of  
6 sites occupied by black spruce. With  
7 full-tree logging there is often very  
8 little remaining debris."

9 And pages 113 to 114, first of all, the second but last  
10 paragraph on page 113 with regard to the nitrogen  
11 cycle:

12 "Since uptake has also been drastically  
13 reduced by crop removal, excessive losses  
14 through leaching of the mineralized  
15 nitrogen may occur until predisturbance  
16 uptake levels are re-established by  
17 incoming pioneer vegetation."

18 And this is a theme we will come back to.

19 You would agree, Mr. Armson, that the  
20 authors of a number of these studies indicate concern  
21 about the leaching of nutrients after harvest?

22 A. There is considerable concern as  
23 expressed in conjectures in this paper.

24 Q. You describe the concerns in all of  
25 the papers as mere conjecture?



1                   A. No, I would say that in certain of  
2 the papers there is some -- there are concerns and they  
3 are related back to some pieces of evidence, but I  
4 would suggest to you that this paper in particular, or  
5 is one of them, has a considerable amount of conjecture  
6 in it.

7                   Q. Let's finish going through the paper  
8 and we will come back to the discussion. If I can just  
9 continue reading on page 113:

10                   "The importance of slash on harvested  
11 land should be emphasized. Slash acts  
12 both as an environment where decomposers  
13 immobilize large quantities of nitrogen  
14 and prevent loss from the ecosystem, and  
15 also, as part of the reserves, a nutrient  
16 sink from which nutrients will gradually  
17 become available as the slash decomposes.  
18 These effects are particularly  
19 consequential in cool northern ecosystems  
20 and in the generally acid soils of the  
21 Canadian Shield. Harvesters, therefore,  
22 which strip the branches from the boles  
23 before extraction and leave them on the  
24 growing site, are much to be preferred to  
25 those which, as in full-tree logging,

1 draw the tops to a landing with the  
2 boles.

3 On sites of moderate to low fertility,  
4 two advantages are apparent:

5 1) substantial amounts of the nutrient  
6 capital are left on site; and,

7 2) increased residues will assist in  
8 lowering initial levels of nitrogen  
9 mineralization and increase

10 immobilization, therefore making less  
11 nitrogen available for leaching.

12 Similarly, in the case of whole-tree  
13 logging, stump axes and major roots

14 left on-site will both assist in  
15 retaining residual reserves and

16 providing and immobilizing substrats.

17 Wiklander showed that the uprooting of  
18 spruce and pine stumps resulted in

19 increased losses of nitrate even on low  
20 quality sites."

21 Then conclusions, paragraph 4, with regard to --

22 "In all cases almost half the total

23 organic pool above and belowground was

24 in the standing crop..." et cetera.

25 And his conclusion there is:

1 "This could make these sites vulnerable  
2 under full-tree harvesting."

3 In paragraph 7:

4 "Bioelement stores of phosphorus and  
5 black  
6 spruce outwash..."et cetera"...it is on.  
7 these sites that nutrient stress might be  
8 expected  
9 following full-tree harvesting."

10 And then paragraph 11 again repeats that:

11 "Since most harvesting of the boreal  
12 forest is now full-tree logging with  
13 whole-tree harvesting becoming much more  
14 widespread, it is advocated that  
15 harvesters be used which strip the  
16 branches from the boles before extraction  
17 and leave them on the site."

18 So this author too has some concerns about particular  
19 sites which could suffer in terms of productivity in  
20 the long term from nutrient loss following full-tree  
21 harvesting; is that not correct?

22 A. Oh, he has expressed concerns, yes.

23 Q. And this is a Ministry scientist?

24 A. That's correct.

25 Q. Now, the present study referred to,

1       which is the next on the column, is one that you have  
2       included in Panel 9; is it not, Foster and Morrison  
3       1978 study of Upland Black Spruce?

4                   A.   Yes.

5                   Q.   And that's...

6                   MR. COSMAN:  Mr. Chairman, I wonder if I  
7       may, before my friend continues, with respect to the  
8       last author - and perhaps the same tactic will be put  
9       with respect to the present paper - it is one thing, of  
10      course, to put a statement to a witness and ask the  
11      witness whether he or she agrees with that statement,  
12      but to read through a paper where the person is not  
13      here and subject to cross-examination, of course as my  
14      friend knows, is not evidence.

15                   That it has very little value to us  
16      unless we know what the witness thinks of it, because  
17      otherwise it is nothing more than my friend reading the  
18      paper of someone who isn't here whose evidence can be  
19      tested.

20                   It is one thing to say:  Are these the  
21      concerns that are expressed.  That's fine.  The  
22      question is:  What does this witness think about it or  
23      what is his opinion about it, so that we can have the  
24      benefit of that evidence.

25                   MS. SWENARCHUK:  Well, Mr. Chairman, in



1       this case I take the position that these articles  
2       referred upon by the witness and by Ministry are in  
3       evidence before you, and Mr. Armson last week gave you  
4       certain characterization of the findings of these  
5       studies without filing them at that time.

6               I think it is useful for the Board to see  
7       the actual comments of the authors and Mr. Armson will  
8       have his opportunity then to speak to these comments.  
9       But certainly it is my position that the Ministry has  
10      put these papers in evidence.

11             THE CHAIRMAN: Well, it certainly appears  
12      that these papers have been referred to in evidence  
13      given by the Ministry, whether or not they have been  
14      relied upon by the Ministry.

15             MS. SWENARCHUK: Mr. Chairman, if you  
16      consider Mr. Armson's evidence of last week, I believe  
17      that he said that one of these six studies came to a  
18      certain conclusion; namely, the Timmer study, and he  
19      was distinguishing that from the results in other  
20      studies.

21             I think it is important for the Board to  
22      be aware of the details of findings of the other  
23      studies as well. Again, it is my position that Mr.  
24      Armson quite specifically was relying on these studies  
25      in his testimony last week.

1                   MR. COSMAN: Well, I certainly don't know  
2                   that, Mr. Chairman, it hasn't been put to this witness.  
3                   I certainly agree that my friend has the right to refer  
4                   to them, but anything that's referred to in the course  
5                   of these hearings as a study surely doesn't become  
6                   evidence that you can rely upon.

7                   This is a statement in a report. The  
8                   person may or may not be -- may not have done a good  
9                   job, may have done a good job, it may have been  
10                  something that was filed in the basket by the Ministry.  
11                  I would like to have the opinion of the Ministry  
12                  witness.

13                  THE CHAIRMAN: Well, I think, Mr. Cosman,  
14                  the only point that Mr. Swenarchuk is trying to make is  
15                  that in Mr. Armson's evidence last week he referred to  
16                  all of the studies but chose, for whatever reason, to  
17                  indicate that only one of them indicated some concerns  
18                  with full-tree harvesting.

19                  MR. ARMSON: If I may, it made very  
20                  specific recommendations. I believe that was the key  
21                  point in the one study.

22                  THE CHAIRMAN: Against.

23                  MR. ARMSON: Against.

24                  THE CHAIRMAN: Right.

25                  MR. ARMSON: The others raised concerns,

1       there is no question about that.

2                   THE CHAIRMAN: Well, in any event, this  
3       is more properly, I would suggest, a matter for  
4       re-examination by Mr. Freidin if he so chooses to do  
5       that in trying to clarify what your opinions may or may  
6       not be with respect to these other studies.

7                   Certainly it is not incumbent on you, I  
8       think, Ms. Swenarchuk, to conduct that re-examination  
9       in terms of your cross-examination.

10                  MS. SWENARCHUK: My purpose in  
11       conducting -- in bringing these factors to the Board's  
12       attention is not to conduct a re-examination.

13                  THE CHAIRMAN: I would assume that's the  
14       case.

15                  MS. SWENARCHUK: But to elucidate rather  
16       further the type of investigation and type of results  
17       and conclusions which were reached by the authors.

18                  Surely we are entitled to examine more  
19       fully studies which the Ministry indicates that it is  
20       relying on to arrive at a certain opinion. And prior  
21       to my having provided you with these studies, they were  
22       not available to you; the reference was available, but  
23       not the studies.

24                  MR. COSMAN: There is no question. The  
25       witness -- there is no question. I can argue, my

1 friend can argue, I can say --

2 MS. SWENARCHUK: There will be a question  
3 at the point that I am prepared to place it.

4 Q. Now, the last article in the list --  
5 sorry, the next one is the present study which, as I  
6 say, is the 1987 study included, starting at page 77 of  
7 Panel 9.

8 MR. MARTEL: What page, please?

9 MS. SWENARCHUK: Page 77.

10 MR. MARTEL: Thank you.

11 MS. SWENARCHUK: Q. Let's just clarify,  
12 Mr. Armson, the Weetman and Webber study was on Quebec  
13 sites?

14 A. That's right.

15 Q. The Gordon study was Ontario sites?

16 A. Yes.

17 Q. And this Foster and Morrison study is  
18 also Ontario sites?

19 A. That's correct.

20 Q. It is upland black spruce in which he  
21 makes estimates based on 100-year rotation and the  
22 location of the sites was in the vicinity of Lake  
23 Nipigon?

24 A. That's correct.

25 Q. Now, at page 79, on the left-hand



1 column under Vegetation; Nutrient Contents he has  
2 indicated that:

3 "The results of this study apply only to  
4 a limited but very representative area  
5 of shallow podzolic soils supporting  
6 upland black spruce near Nipigon,  
7 Ontario because nutrient accumulation is  
8 site and species specific."

9 And then he notes on the top of the next column:

10 "The results of the vegetation assessment  
11 indicate that full-tree harvesting of  
12 this spruce stand would exert a  
13 considerably higher nutrient drain on  
14 soil reserves than would conventional  
15 (stems only) logging."

16 And then I believe at page 80 on the top right he finds  
17 that:

18 "There were sufficient nutrient reserves  
19 in the soil to replace the projected  
20 nutrient  
21 drain associated with another 100-year  
22 rotation of  
23 spruce if conventional harvesting were  
24 conducted."

25 And then on page 81 at the bottom of the left-hand

1 column, he refers again to the cautions in Weetman &  
2 Webber and Gordon & Timmer about infertile or shallow  
3 soils, and says:

4 "These studies document the large  
5 site-to-site variability in nutrient  
6 reserves..."

7 And then goes on to say that:

8 "It is difficult to generalize about  
9 potential  
10 impacts."

11 Then in summary, in his last paragraph indicates --  
12 second sentence of that paragraph:

13 "There appear to be sufficient nutrient  
14 reserves and replenishment at this site  
15 after full-tree logging despite the  
16 restricted rooting depth and volume to  
17 sustain the next generation of spruce  
18 through the early growth period.

19 Thereafter, nutrient drain on the soil  
20 reserves will be reduced by the extent  
21 that nutrient needs are met my nutrient  
22 cycling within the tree and the stand.  
23 These conclusions are based on the  
24 assumption that soil nutrient reserves  
25 will be protected from leaching and

1 erosion by rapid revegetation."

2 And presumably would you agree that, absent rapid  
3 revegetation, the suggestion is that the drain on  
4 nutrient reserves could continue?

5 A. He specifically mentions the  
6 revegetation as a key point. He also, if I may, on  
7 page 79 states that:

8 "From a nutritional point of view it is  
9 the nutrient content of the humus and  
10 surface mineral horizons that is critical  
11 for black spruce because fine roots are  
12 commonly most abundant there."

13 So associating the nutrient pool that is critical for  
14 the black spruce with that zone, not with the slash.

15 Q. Yes. So would you agree then, Mr.  
16 Armson, that there is more than one out of these papers  
17 that you relied on that indicates that there could be a  
18 negative impact on nutrient loss from full-tree  
19 harvesting on infertile, fragile or shallow sites, it  
20 is not only the Timmer paper that came to that  
21 conclusion?

22 A. The Timmer paper made the  
23 recommendations. Concerns were expressed in the  
24 others, but they were qualified in all instances.

25 Q. And that qualification perhaps is a

1 result of the current state of scientific knowledge  
2 about the effects of nutrient cycling over the long  
3 term?

4 A. Yes, and it is also related, I think,  
5 to their particular data and situation which they  
6 studied.

7 Q. However, amongst the sites in Ontario  
8 or in Quebec - and I believe you indicated last week  
9 that you would be prepared to consider applicable with  
10 the necessary qualification in Ontario - results from  
11 similar sites--

12 A. Yes.

13 Q. --or boreal forest types? Then we  
14 have a number of these site-specific studies, at least  
15 half of which dealing with boreal type sites, have  
16 qualified to some extent the endorsement, shall we say,  
17 of full-tree logging on something that they call  
18 infertile or shallow or fragile sites?

19 A. Yes, they have specified those  
20 particular conditions in each case.

21 Q. Now, does it remain your opinion,  
22 though, that full-tree harvesting has not been shown to  
23 indicate possible negative effects on nutrient cycling  
24 over the long term on these types of sites?

25 A. No, I believe the words in my



1 evidence were that it has not been shown to have a  
2 deleterious effect or reduce subsequent forest  
3 development. That was -- in my particular evidence, I  
4 was very careful to state that.

5 Q. You mean it has not been conclusively  
6 shown?

7 A. No. If I may return to my statement,  
8 this is on page 52 of the Panel 9 evidence, and this is  
9 part of -- it is actually part of a paragraph that  
10 begins on page 51.

11 And, if I might, Mr. Chairman, I think if  
12 I read the whole paragraph it will perhaps bring this  
13 out. I state:

14 "There have been many studies and reviews  
15 on nutrient cycles in different forests.  
16 The fact that trees take several decades  
17 to develop to maturity, that they  
18 annually return significant amounts of  
19 nutrients to the soil in the form of  
20 litter, together with the numerous  
21 changes in the forest as it develops over  
22 time, serves to distinguish forests from  
23 agricultural crops. Further, larger  
24 amounts of nutrients usually remain in  
25 the forest after harvesting in the form

1 of roots, slash and the forest floor.  
2 Under the present types of timber  
3 management activities, even with  
4 full-tree harvesting which results in  
5 the removal of most of the tree canopies,  
6 there is little, if any evidence, that  
7 such removal significantly reduces  
8 nutrient levels in the forest system so  
9 as to impact on future forest  
10 development."

11 And I think that is -- that was a very key statement.

12 It may in fact be shown to have an impact  
13 on the order of magnitude of pools - and I don't  
14 dispute that - but that was not what I was referring to  
15 in that statement.

16 Q. Aren't these authors expressing  
17 concern for exactly that point, that on something  
18 called fragile, shallow or infertile sites that the  
19 degree of nutrient loss -- we can see that on those  
20 sites it is replenished over the life of the new  
21 growth, but on these sites the degree of nutrient loss  
22 and the rate of replenishment may be such that in fact  
23 future forest growth is affected?

24 A. Yes. I said there is little evidence  
25 that future forest growth is affected. I didn't say

1       that there were -- anything about the concerns. There  
2       have been these concerns as expressed but I, in my  
3       statement, was very clear in referring to future  
4       evidence of affecting that development.

5                   THE CHAIRMAN: Well, do you share any of  
6       these concerns?

7                   MR. ARMSON: I think, as I indicated last  
8       week, there are certain sites that I would have a  
9       concern for and I would certainly consider whether --  
10      very seriously whether full-tree or conventional  
11      tree-length harvesting would apply, and I think I gave  
12      one example already of such a situation.

13                   But I would be very -- professionally I  
14      think I would be wrong in saying there is some blanket  
15      categorical set of conditions that could easily be  
16      identified and applied as a rule.

17                   MS. SWENARCHUK: Q. You go on on that  
18      page, Mr. Armson, on page 52, in the second paragraph  
19      to say:

20                   "Studies of jack pipe and black spruce in  
21      Ontario's boreal forest indicate that  
22      even shortening rotations to 40 or 50  
23      years will not result in nutrient losses  
24      from harvesting that can be considered  
25      detrimental to future forest growth."

1 Then you refer to the articles which you have included:  
2 reference No. 1 being the Foster and Morrison study of  
3 a natural jack pine stand in which they refer to  
4 rotation age of 60 years;  
5 the second site being the paper we have just looked at  
6 in which they refer to a rotation period of a hundred  
7 years -- 100-year rotations are estimated and  
8 discussed.

9 Now, to my knowledge, only the Weetman  
10 and Webber paper that we referred to earlier spoke of a  
11 50-year rotation; these two do not, and the Weetman  
12 paper was not an Ontario study.

13 What evidence do you have then to rely  
14 upon to say that the 40 or 50-year rotation has been  
15 indicated will not result in nutrient losses?

16 A. If I may, that was the jack pine  
17 paper.

18 Q. The jack pine paper.

19 A. Yes, that was the study from the  
20 Chapleau area.

21 Q. The first paragraph that says:

22 "It is generally of sufficient size in  
23 Ontario at age 60 for harvesting as  
24 pulpwood."

25 And on page 73 again, the fourth paragraph down, the



1 last sentence, I am referring to an acceptance of  
2 logging on the stand and the ability of the site to  
3 replenish again says -- again refers to a 60-year  
4 rotation.

5 A. I agree and I think that, if I may, I  
6 believe the paper that I am referring to here, there  
7 was a further paper by -- or a somewhat earlier paper  
8 by Foster in the same area in a younger stand - and I  
9 stand corrected on the age there, Ms. Swenarchuk - but  
10 referred to a 30-year-old stand.

11 Q. So you will provide us with that  
12 paper; will you?

13 A. Yes, I will.

14 Q. Now, if we could look at another  
15 source relied upon by the Ministry, it is another  
16 Weetman document which is included in Panel 10, Volume  
17 I at page 349, and on the left-hand column at the end  
18 of that first long paragraph he indicates that:

19 "Whole-tree logging is not recommended on  
20 poor forest sites with low nutrient  
21 reserves."

22 And then skipping one paragraph, the short paragraph  
23 near the bottom of the page:

24 "Site depletion by nutrient exports in  
25 harvesting trees does not now seem to be

1                   of major concern provided full-tree  
2                   harvesting is restricted to good sites."  
3       So that is a recommendation; is it not, for restriction  
4       to only what he calls good sites?

5                   A. Yes, and this is a general paper,  
6       yes.

7                   THE CHAIRMAN: Good time for a break?

8                   MS. SWENARCHUK: I think so, yes.

9                   THE CHAIRMAN: Okay. We will break for  
10      20 minutes.

11                   Thank you.

12      ---Recess taken at 2:35 p.m.

13      ---Upon resuming at 3:10 p.m.

14                   THE CHAIRMAN: Thank you. Be seated,  
15      please.

16                   Ms. Swenarchuk, the Board is prepared to  
17      adjourn for the day whenever you feel you would like  
18      to.

19                   MS. SWENARCHUK: Thank you.

20                   THE CHAIRMAN: I understand that you are  
21      not feeling well.

22                   MS. SWENARCHUK: Q. Now, just for  
23      clarification, Mr. Armson - and perhaps to answer Mr.  
24      Cosman's question earlier - if we look at the  
25      transcript from your testimony of last week, Volume 72

1 at page 11236, Mr. Freidin asked you:

2 "Did those five authors, the studies,  
3 other than the one, did they make any  
4 statement as to whether or not the  
5 practice of full-tree harvesting was one  
6 that should be limited?"

7 And the answer from you, Mr. Armson is:

8 "They concluded that it should not  
9 be, that full-tree harvesting was  
10 something that should not be precluded on  
11 these sites."

12 Now, perhaps you want to debate the exact words you  
13 used, but I think -- isn't it fair that the Board  
14 should be aware that more than one of these authors  
15 concluded that there may be a problem with full-tree  
16 harvesting on sensitive, fragile, shallow sites?

17 A. They expressed...

18 Q. And that perhaps on those sites  
19 full-tree harvesting should be avoided?

20 A. Yes, they expressed concern and --  
21 but they did not preclude it in a categorical sense.  
22 That is all I was saying there.

23 Q. I don't recall that you brought to  
24 the Board's attention the concerns they expressed  
25 regarding possible, negative impact on future forest

1 growth.

2 A. Not at that time, that's correct.

3 Q. Right. Now, would you agree with me  
4 that following harvest, soil erosion or leaching of  
5 nutrients could contribute to further nutrient loss?

6 A. It could, yes.

7 Q. And that there has been a reference  
8 in some of these papers, both the Foster, Morrison  
9 papers and the Gordon paper to the need for rapid  
10 revegetation of the site after harvest?

11 THE CHAIRMAN: Excuse me, Ms. Swenarchuk,  
12 some of the parties are having trouble hearing at the  
13 back.

14 ---Discussion off the record.

15 MS. SWENARCHUK: Q. I'm sorry, what was  
16 your answer to that question, or did you get the  
17 question?

18 A. Yes, they referred to possible losses  
19 by erosion and by leaching particularly.

20 Q. Right. And would you agree that  
21 suppressing the competing vegetation as by the use of  
22 herbicides, for example, after logging, by retarding  
23 revegetation could contribute to further nutrient loss?

24 A. It might and it might not. When you  
25 talk of suppressing the vegetation, it depends on how



1 much vegetation you are suppressing. We are into an  
2 area here of: Are we suppressing all the vegetation,  
3 is herbicide used, and it may or may not be.

4 Q. So then are you saying that the  
5 degree to which the replenishment of nutrients would be  
6 retarded by herbicide use would depend on the degree to  
7 which revegetation is retarded?

8 A. The loss of nutrients can be  
9 minimized by revegetation. Where the revegetation is  
10 limited in some way, then that can - not necessarily -  
11 can in fact increase the amount that could be lost,  
12 particularly by leaching rather than by erosion.

13 Q. Now, I believe you indicated in your  
14 testimony last week that erosion is - I am paraphrasing  
15 you loosely - seldom a problem after harvest?

16 A. In terms of evidence for it, from  
17 harvesting it per se, yes.

18 Q. I am looking again at the Weetman  
19 paper in Panel 10, Volume I at page 351. Do you agree  
20 with this statement by Mr. Weetman on the second  
21 paragraph of the extreme right-hand column:

22 "The removal of the forest litter layer  
23 exposes the soil to erosion by rain. The  
24 crumb structure of the soil breaks down  
25 and fine particles of soil flood the pore

1 spaces in the underlying soil."

2 And in the column immediately to the left of that:

3 "The most direct impact of logging on  
4 site fertility is by removal of the upper  
5 soil horizons either directly or by  
6 bulldozing or by subsequent soil  
7 erosion."

8 A. He is talking about removal of the  
9 upper soil horizons and I think I was very clear in  
10 stating that the key factors to maintain the forest  
11 floor, by that, that does not mean there is any removal  
12 of the upper soil horizons.

13 Q. But he is saying that this is a  
14 direct impact of logging.

15 A. Well, it is a very general statement.  
16 I would suggest -- or I would disagree with that as a  
17 direct statement as it applies to this area of the  
18 undertaking.

19 Q. Presumably it can be an issue in some  
20 sites; can it not?

21 A. Well, it certainly can and  
22 particularly in certain kinds of road construction.

23 Q. Now, just continuing further on this  
24 question of concern for fragile sites, you have also  
25 included the paper again by Nicholson, Foster and

1 Morrison in Panel 9 regarding hydrologic cycling and  
2 possible nutrient loss, and that begins at page 83.

3 And without going through the entire  
4 paper, the authors indicate, as you did last week the  
5 increase in waterflow and the attendant loss in  
6 nutrients that can follow harvest.

7 And at page 95, if you could just note  
8 the first paragraph:

9 "If more complete utilization occurs  
10 where any or all of the crown, stump and  
11 roots are also taken such as in  
12 whole-tree harvesting which removes  
13 crown, boles and stump more than double  
14 the amount of nutrient would be removed  
15 from the site."

16 Would you agree then that the nutrient loss would be  
17 greater with whole-tree harvest?

18 A. Which does not occur, whole-tree  
19 harvesting. He is referring to the removal of the  
20 stump and roots.

21 Q. Yes, agreed. Whole-tree harvest  
22 referring to root removal as well. If it were  
23 full-tree harvest the crown and boles would be removed  
24 but not the stump. Presumably that too would result in  
25 higher nutrient loss than simply conventional

1 tree-length harvest; would it not?

2 A. If I might, the orders...

3 Q. Not double, I agree.

4 A. Well, the orders of magnitude in that  
5 table for crown plus root plus stumps are large, but  
6 without the partitioning I can't speak to how much that  
7 would be.

8 Q. Agreed.

9 A. It is kind of lumped together.

10 Q. But presumably it would be greater?

11 A. With boles, with crown, yes it would  
12 be some...

13 Q. Yes. If we look at page 98 they  
14 indicate that there is substantial loss through the  
15 fourth year with the increased water yield.

16 And then in the second paragraph we see  
17 their concern:

18 "The persistence of elevated water yields  
19 could be important to site fertility  
20 especially on very shallow soil fragile  
21 sites. The Canadian Shield landscape is  
22 a display of hills, ridges, valleys and  
23 lakes having irregular configurations  
24 controlled by the bedrock structural  
25 features and covered to varying degrees



1                   in a random fashion by shallow glacial  
2                   detritus."

3       I take it they are indicating there that a significant  
4       amount of the Canadian Shield consists of shallow  
5       sites?

6                   A.   Yes, it is a very general statement.

7                   Q.   Right.

8                   MS. SWENARCHUK:   Mr. Chairman, I think I  
9       would like to stop there for today.

10                  THE CHAIRMAN:   Okay.

11                  Ladies and gentlemen, we are going to  
12       adjourn now for the day, but I think tomorrow we are  
13       going to start at nine o'clock as opposed to 8:30.

14                  We are going to be back next week in any  
15       event to hear further evidence and tomorrow is an  
16       exceptionally long day, at least for the Board members  
17       and those who are going on to Timmins, so rather than  
18       try and start at 8:30 as we normally would when we are  
19       going to break early, we will start at nine o'clock.

20                  MR. COSMAN:   Mr. Chairman, have the Board  
21       received any indication in its communication from the  
22       one party that wished to cross-examine as to how long  
23       that would be?

24                  The only reason I am raising it, I am  
25       just wondering if Panel 10 is going to start next week,

1 just so I can...

2 THE CHAIRMAN: No, we haven't, but I will  
3 have Mr. Mander make some inquiries tonight and we  
4 should be able to provide you with that tomorrow.

5 MR. COSMAN: Thank you very much.

6 THE CHAIRMAN: We will adjourn until 9:00  
7 a.m.

8 Thank you.

9 ---Whereupon the hearing adjourned at 3:20 p.m., to be  
10 reconvened on Wednesday, February 22nd, 1989,  
commencing at 9:00 a.m.

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